# the OIL AND GAS JOURNAL

SEPTEMBER 15, 1958



EXPLORATION HIGHLIGHTS P. 283

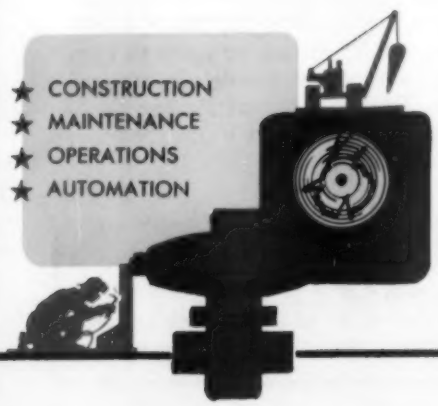
CURRENT STATISTICS P. 305


## Kerosine Will Power the Jet Age p. 101

## What New Imports Program Means p. 104

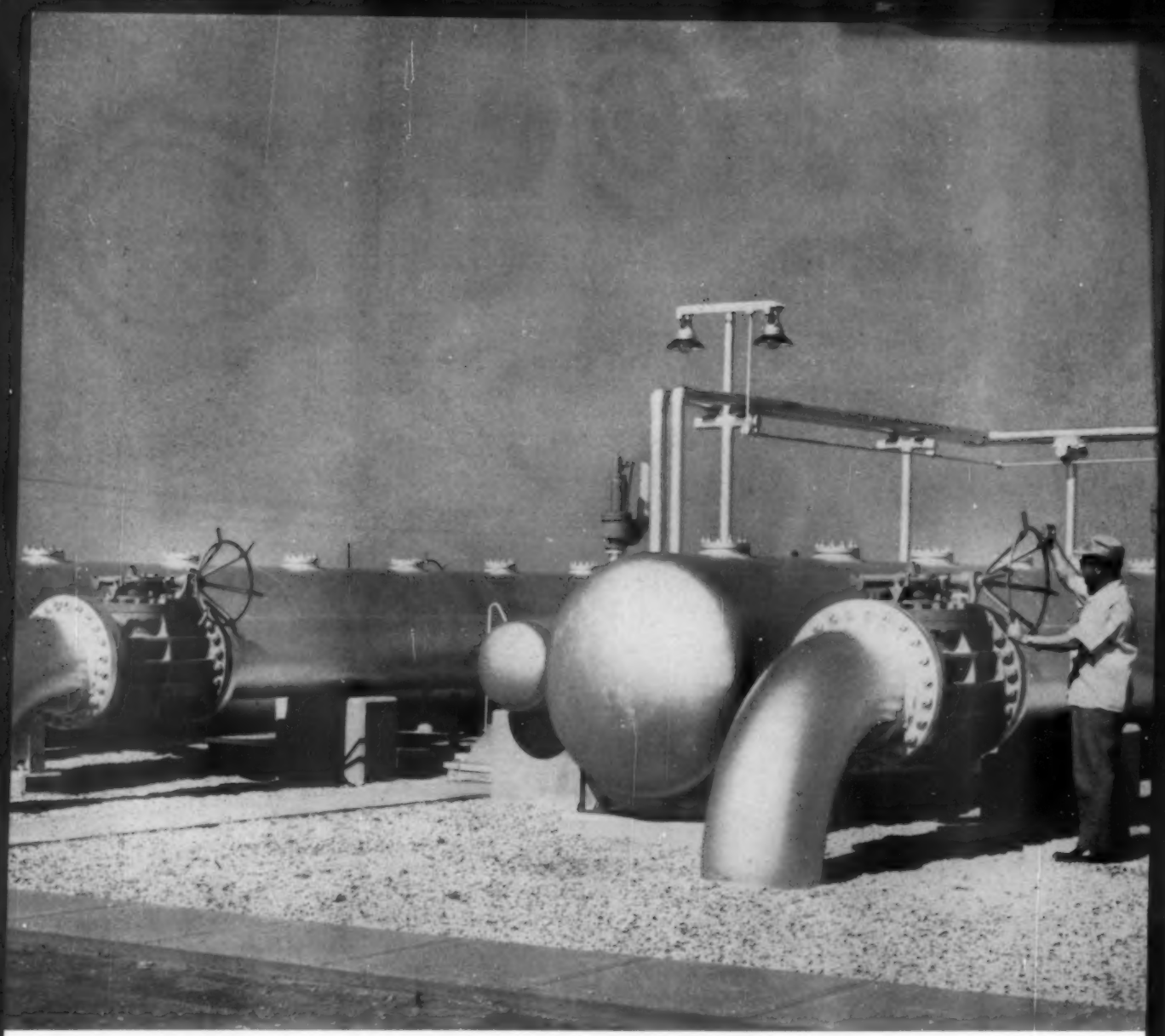
## Alberta Has World's Biggest Gasser p. 108

ONE DOLLAR PER COPY




## ANNUAL PIPELINE NUMBER

Starts p. 123



# CLOSES IN MINUTES . . . NOT HOURS!

**Ordinary pipeline valves, in larger sizes, often take hours to open or close. The largest Rockwell-Nordstrom lubricated plug valve can be fully opened or fully closed as quickly as you want.**

While the stem in ordinary valves must be "wound" through hundreds of turns to bring together and set the metal-to-metal seats, a Rockwell-Nordstrom valve is full open or full closed when the plug is rotated through only 90°. This quarter-turn operation is much easier because the plug rotates on a film of lubricant. And, the combination of the firmly seated tapered plug and the unique seal of pressurized lubricant assures really positive shut-off.

Whatever your needs, there is a Rockwell-Nordstrom valve that will do the job better, longer and at far lower cost. They cost no more to buy, often less, than ordinary valves. For details, see your supplier or write, Rockwell Manufacturing Company, Pittsburgh 8, Pa. Canadian Valve Licensee: Peacock Brothers Limited.

ROCKWELL-Nordstrom VALVES

it's **ROCKWELL**

MANUFACTURING COMPANY

The OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
Sept. 15, 1958

Oil executives in Venezuela privately are worried:

They fear the industry there may be in for some stormy weather—especially on the political and labor fronts.

Recent ill-fated coup and short general strike are signs of deep-seated unrest. Elements in the Army don't like the leftist tinge of the ruling Junta. Labor unions are using the general strike technique to demonstrate their strength.

Center of labor trouble for oil management is eastern Venezuela. Complaints of grievances against supervisors in that region suddenly have skyrocketed. It has taken on appearance of organized campaign to discredit management.

What concerns oil men is the lack of a champion for business among the Junta. This lays business interests open to sniping from both politicians and labor.

Expropriation is not considered a threat yet—but discrimination against foreign companies in letting contracting jobs has the foreign operators wondering.

▼ ▼ ▼

New IMPORTS plan is talk of the industry now.

Oil men have 30 days to come up with a better idea or accept Carson's proposal. There's a threat of mandatory controls later if voluntary approach fails this time.

Carson proposes a gradual shift of quotas to a refinery-run basis by 1960. At that time total imports will range from 10 to 12% of total refinery runs.

Other highlights: Importers without refineries are out. Unfinished products are limited. Refineries operating on Canadian crude will get special consideration (p. 104).

▼ ▼ ▼

Future of gasoline MARKET may be determined in next few weeks by way refiners approach problem of supply.

Gasoline prices last week remained unchanged but on the soft side. Demand held up well in spite of evidences of a heavy inventory picture. Interest in light-heating oils picked up but not very much.

Cause of concern: Despite some refinery cutbacks, crude runs last week hit the year's peak, gasoline stocks went up 723,000 bbl. over previous week. Both should be down now.

EXPLORATION men expect wildcatting to spurt in Alberta Foothills this winter (p. 108).

The A-8 Berland River of British American and Shell, now rated world's biggest gasser, will provide the spark. Some Canadians predict there'll be a shortage of deep-drilling equipment by the time hard freeze comes.

The Berland strike has open-flow potential of 1.5 billion cubic feet of gas daily. It also is Canada's deepest production and has penetrated the thickest reef ever found.

Possibility of similar reefing conditions will lure more wildcatting in the foothills and western plains.

Top exploration event of 1958 for the Four Corners likely will be Humble's Apache County discovery in northeastern Arizona.

Oil flowed at rate of more than 40 bbl. per hour from the Pennsylvanian. Humble has set pipe at the well which promises to entrench Arizona in the oil-production column.

Elsewhere in the Four Corners: Superior Oil completed the 13-31 Navajo-C, San Juan County, Utah, for 600 bbl. daily on 26/64-in. choke. This link well is one-half mile south of Aneth and ¾-mile north of McElmo Creek.

A boost has been given lagging interest in the Outlook region of northeastern Montana.

H. L. Hunt's Sheridan County wildcat, 8 miles southwest of Outlook field, on a drill-stem test in the Devonian recovered oil with possible commercial prospects. Drilling is continuing.

Success of well would revive this area. It first hit the news 3 years ago when deep Silurian production was opened in a remote sector of Williston basin. Silurian strikes were followed by other pre-Madison producers.

Other exploration events:

...Wyoming's Green River basin continues to lead drilling news in the Central Rockies. A Wasatch wildcat, 8 miles west of South Baggs field near the Colorado line, flowed more than 3,000 M.c.f. of gas daily. Well is a Gulf test.

...Texas Panhandle has a new record deep hole. Max Pray 1 Mills, Wheeler County, is dry at 16,156 ft. in conglomerate. It broke former depth record held by Magnolia at 1 Feldman in Hemphill County at 15,997 ft.

...Seismic operations in the Matanuska Valley of Alaska are planned for this winter by Union and Ohio. Results will be watched with interest by other operators interested in oil prospects for Alaska.

▼ ▼ ▼

PIPELINERS can expect a decision soon on the 2,500-mile LPG line from Houston to New York proposed by the Katy and New York Central railroads.

Proposed throughput agreements and tariffs were mailed to potential shippers about 3 weeks ago. The railroads are now awaiting information from interconnecting lines as to possible tariffs for transshipments.

All parties expect to decide within a few weeks whether to go ahead with the $100-million project.

A smooth, high-quality job is being achieved for TGT in first large-scale, 30-in. pipeline construction in marshes of the Louisiana Gulf Coast (p. 124).

Wide cracks—common on marine projects—are nowhere to be found on the concrete coating.

Chief reason: A new specified minimum curvature of pipe with radius of at least 2,500 ft. is required while pipe is being launched from the end of the barge.

Rumors that Texas Eastern Transmission and Delhi-Taylor are cooking up a multimillion dollar merger are partly true.

Negotiations started nearly 3 months ago but stalled on Delhi-Taylor's asking price. Fate of deal now reportedly rests with Texas Eastern increasing its offer. Delhi-Taylor's 1957 gross income was $67.9 million and net $3.9 million.

▼ ▼ ▼

REFINERS can still count on kerosine to start its rise as a big-volume product next year (p. 101).

But soaring kerosine demand in the years ahead won't be nearly so high as estimated a year ago. The reason: Speed of jet planes, plus their huge carrying capacity, will permit airlines to do their job with fewer flying hours than anticipated.

Big boost for kerosine comes from decision of airlines to use the kerosine-type fuel. The military is still sticking with JP-4.

This is expected to push kerosine-type jet fuel demand to 35,000 bbl. daily next year, 70,000 bbl. in 1960 and 150,000 bbl. by 1962.

One pinch may develop: Crudes yielding low-freeze-point kerosine required are not universal. They are scarce in some areas. One major has quit hunting jet-fuel contracts because it has no more of these crudes in sight.

Compression ratios will average higher in 1959 Chrysler line of autos.

Nine of the 15 models top out at ratios of 10.1:1. Average for all is 9.67:1, up .07 from 1958.

This is still under top ratios of Ford and General Motors who have yet to take technical wraps off their entire line.

Other Chrysler innovations:

...Fuel injection has been dropped from the whole line.

...Fuel savings up to 10% have been realized in some of

the V-8's by lower rear axle gear ratio, improved carburetion and manifolding, and aerodynamic styling.

Plans for a new Lake Maracaibo refinery are being examined by the Venezuelan Ministry of Mines.

The plant will be built by a group of newcomers to the lake, who must refine 15% of their crude production within the country.

Two major changes now going on in the industry have been charted by Jersey Standard President M. J. Rathbone:

...Private-brand outlets have increased tremendously in last few years. They offer lower price and still enjoy an adequate profit. They prove motoring public wants low-cost distribution.

...Non-Integrated refiners have grown much faster than large integrated companies in plant capacity. Their success has caused former ideas of the minimum efficient size for refineries to be revised sharply downward.

▼ ▼ ▼

In the INTERNATIONAL scene, Western Europe is building up its oil stocks in case of Middle East trouble.

Tipoff is tanker movements through the Suez Canal. They have jumped 25% since the Iraq revolution in July.

A convoy of 19 tankers set a record 1-day oil transit recently when it moved 580,000 tons or about 4,250,000 bbl. through the canal. Flags on the ships represented Britain, France, Italy, Norway, Denmark, Sweden, Holland, and Russia.

Foreign bulletins:

New Middle East oil field may be in the making by an English-French combine. First wildcat drilled 20 miles off Das Island in Persian Gulf flowed at rate of 2,400 bbl. daily on limited testing. More wildcatting is planned (p. 120).

Jordan officials, according to press reports from Amman, are in the process of approving transfer of major oil exploration concession to Phillips Petroleum. It means Phillips will take over all the concession it formerly held jointly with Edwin W. Pauley, California independent.

Brazil's Petrobras has offer of long-term financial aid from ENI, Italian state oil agency. Offer involves drilling, production, refining, and pipeline equipment and technical assistance.

British Petroleum startled the financial centers with its 100% stock dividend. Insiders had expected a dividend—the size was the surprise.

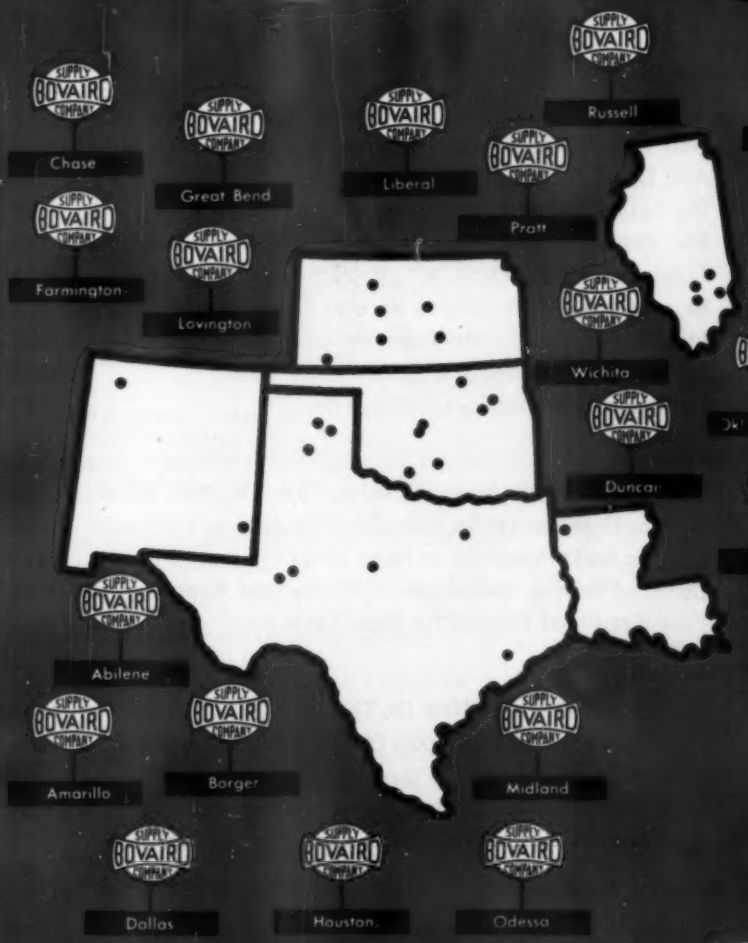
The dividend covers surplus built up by the consortium settlement in Iran. BP gets 10 cents a barrel on all oil output other than its own plus $7 million yearly from Iran.

The Oil and Gas Journal is published weekly by The Petroleum Publishing Co., 211 S. Cheyenne, Tulsa 3, Okla. Second-class postage paid at Tulsa, Okla. United States and foreign rates to the petroleum industry, 1 year $5, 2 years $8, 3 years $10.

SUPPLY BOVAIRD COMPANY

*Strategically Located*

# STORES STOCKS SERVICES




TO GET WHAT YOU WANT
WHERE YOU WANT IT
WHEN YOU NEED IT . . .
AT REASONABLE
COMPETITIVE PRICES

*"Buy From Bovaird"*

THE Bovaird SUPPLY COMPANY

GENERAL OFFICES
TULSA, OKLAHOMA

37 YEARS OF PROGRESS WITH THE OIL INDUSTRY

PESA

the OIL AND GAS JOURNAL

SEPTEMBER 15, 1958 • VOLUME 56 • NUMBER 37

TULSA OFFICE
211 South Cheyenne Ave.
Phone Diamond 3-6291

THE STAFF

George H. Weber ..... Editor
Henry D. Ralph ..... Chief Editorial Writer
Ted A. Armstrong ..... News Editor
Gerald L. Farrar ..... Engineering Editor
Dr. Frank J. Gardner ..... Exploration Editor
Paul Reed ..... Pipeline Editor
John C. Reidel ..... Petrochemical Editor
C. O. Willson ..... Consulting Editor
W. L. Nelson ..... Technical Editor
Lynn M. Nichols ..... Presentation Editor
John C. Casper ..... Economics Editor
W. B. Bleakley ..... Production Editor
Neil Williams ..... Associate Editor
Norman S. Morrisey ..... Drlg.-Development Editor
Carl J. Lawrence ..... Assistant News Editor
Gene T. Kinney ..... Assistant Pipeline Editor
R. B. Tuttle ..... Equipment Editor
C. Dudley Johnston ..... Art Director
Carl Hoot ..... District Editor
John C. McCaslin ..... District Editor
W. A. Bachman ..... District Editor
Robert B. Bizal ..... District Editor
Howard M. Wilson ..... District Editor
Deacon New ..... District Editor
Sara Bangert ..... District Editor
LaWanda Turner ..... Readership Research
Max L. Batcheldor ..... Asst. Pres. Editor
Helen Brown ..... Editorial Assistant
Alice Burt ..... Editorial Assistant
Aileen Contrell ..... Editorial Assistant
Susan Boeckman ..... Editorial Assistant
Margaret Higgs ..... Editorial Assistant
Jo Jeanne Speaker ..... Staff Artist
E. P. Stadler ..... Staff Artist

NEW YORK OFFICE
500 Fifth Avenue
Phone LOngacre 4-6160

Paul Swain ..... International Editor
Larry Resen ..... Refining Editor
Ray G. Gibson ..... District Editor
John P. O'Donnell ..... District Editor

HOUSTON OFFICE
802 American Investors Building
Phone CApitol 4-7726

Ed McGhee ..... Drilling Editor
Joe Reilly ..... District Editor

DALLAS OFFICE
1238 Mercantile Bldg.
Phone Riverside 8-3074

Robert J. Enright ..... District Editor

LOS ANGELES OFFICE
650 South Grand Avenue
Phone MAdison 2-0722

D. H. Stormont ..... West Coast Editor
William T. Smith ..... District Editor

WASHINGTON OFFICE
621 Albee Building
Phone District 7-1710

Bertram F. Linz ..... District Editor

Correspondents at Denver, Pittsburgh, Calgary, Columbus, Ashland, Ky., Oil City, Pa., Mount Pleasant, Mich., Melbourne, Australia; Regina, Sask.; Chatham, Ont.; Casper, Wyo., and Anchorage, Alaska.

POSTMASTER: Send notification (Form 3579) regarding undeliverable magazines to The Oil and Gas Journal, 211 S. Cheyenne, Tulsa 3, Okla.

SUBSCRIBERS: Send subscription correspondence and change of address to The Oil and Gas Journal, 211 S. Cheyenne, Tulsa 3, Okla. Subscribers should notify publisher promptly of any change of address, giving old as well as new address, and including city postal delivery zone, if any. If possible, enclose an address label from a recent issue of the magazine. Allow one month to six weeks for change to become effective.

# IN THE NEWS

**General Interest:**

Gulf Discloses Plan to Make Influence Felt in Politics 112
Auto Changes May Jar Oil-Industry Economics 113
GM Test Car Spurs New Interest in Gas-Turbine Engine 117
U. S. Judge Rejects Motion to Dismiss Oil Indictments 118

**Foreign News:**

Algeria Booms With Field Development, New Concessions 119
Gulf to Help Build New Philippine Refinery 119
Abu Dhabi Finds Oil at Remote Persian Gulf Test 120
Big Italian Gas Market May Spur Middle East Imports 120
Iraq Petroleum Reassured by New Iraq Government 120
Japanese Shop for Deals in Egypt, Ethiopia, Sumatra 121
Reparations Cut, Austria to Receive Russian Crude 121
India to Go Ahead with Assam Refinery Plans 121
Stanvac to Test Acreage in British Somaliland 122
Loffland to Drill for Pan Am in Argentina 122

**Production:**

Shell Plans to Start Water Flood in Texas' K.M.A. Field 109
Bottom-Hole Gas Heater Stimulates Oil Zone in California 111
Humble Seeks Approval of Huge Texas Cycling Project 114
Dispute Flares on Boundaries of Wilmington Repressuring 116
Pilot Fire Flood Planned for West Texas Lease 117

**Processing:**

Oil Has a Big Stake in New Jet-Transport Era 101
New Plan Would Base Import Quotas on Refinery Runs 104
Processing Briefs 110
New Molecular Sieve Process Upgrades Gasoline 115
Paraffins Used to Produce Detergents With Cobalt-60 115

**Drilling-Exploration:**

Canada's Berland River Well World's Biggest Gasser 108
Record Wells in Pecos County and Elk City Go Deeper 109
U. S. Stands to Make $224,000 on Gubik Gas Field Leases 112
Southwest Kansas Development Spurred by Jayhawk Line 283
New Ideas Are Key to Oil Finding 284

**Pipelining:**

Transco Starts Looping Gas Line to Northeast Market 110
Pipeline Briefs 116

OIL AND GAS PIPELINES • REFINING • PETROCHEMICALS
EXPLORATION • DRILLING • PRODUCTION • FIELD PROCESSING

. . . an integrated magazine serving an integrated industry

# ANNUAL PIPELINE NUMBER

TGT Sets a Standard for Marine Pipelaying . . . 124
*By Paul Reed and Gene Kinney*
Line is being laid under the most rigid specifications.

New Coating for Water Construction . . . 129
*By Paul Reed and Gene Kinney*
New rubberized-asphalt-mastic coating is used by Southern Natural.

Nineteen Years of Products Pipelining . . . 132
*By Norman F. Tietze*
Standard of Indiana has developed many improvements enjoyed by industry today.

Maintaining a High-Pressure Gas Line . . . 140
*By David C. Palm*
A report on a 29-year-old operating gas pipeline.

True Combination Angles for Pipeline Bends . . . 145
*By John H. Reagan*
Spherical trigonometry provides shortcut solution.

Meter Station for Pipeline-Refinery Custody Transfer . . . 148
*By Fred E. Pyeatt, Jr.*
Four separate streams are metered before going to refinery storage.

Automatic Control of Diesel-Driven Centrifugal Pumps in Parallel . . . 150
*By K. L. Hall*
Arrangement gives greater flexibility for high static-head conditions.

How a Computer Is Applied to Pipeline Design . . . 157
*By R. W. Leach and W. P. Redmond*
The procedure is outlined by solution of specific problems.

Service Pipe Line Looks at Pump Stations . . . 170
*By J. L. Callahan*
A discussion of the evaluation of stations and some of the economics of the operation.

Automatic and Remote Flow Control for New Wabash Line . . . 176
*By F. A. Moore and J. S. Lavender, Jr.*
Station-selection facilities provide dispatchers with pertinent operating data.

Expansion of Magnolia's Corsicana-Beaumont Line . . . 182
*By George J. Dorris, Jr., and G. A. Lundberg*
Microwave provides remote control, gaging, and automatic blending.

Preventing Dangerous Pressure by Remote Control . . . 193
*By S. M. Hammer*
Automatic command signal consists of coded pulses.

Positive-Displacement Metering . . . 200
*By R. B. Canning*
Technique used by Interprovincial for custody transfer of crude oil saves tankage.

Internal In-Place Pipeline Cleaning . . . 203
*By Frederick F. Tracy*
This preliminary step gives better coating application.

Erosion Control and Backfill Repair . . . 213
*By Harold J. Averett*
Northern Natural's innovation helps lick this problem.

Automatic Emergency Shutoff Protects Against Spills . . . 217
*By W. B. Anderson and R. R. Hancox*
Six compartments load simultaneously without danger of spill at terminal.

## TECHNOLOGY—OPERATION

Photographs of Scale Models Speed Process-Unit Design . . . 222
*By George Weber*
Reduced number of detailed conventional drawings means smaller costs.

Primary Cementing—3: Sound Casing Procedures Are Vital . . . 226
*By E. H. Clarke, Jr., and A. S. Murray*
The concluding article in a three-part series.

Here's Where We Are On In Situ Combustion . . . 232
*By J. S. McNiel, Jr., and J. T. Moss*

The Refiner's Notebook . . . 243

Process Costimating . . . 244

## DEPARTMENTS

| | | | | | |
|---|---|---|---|---|---|
| They Say | 83 | Process Costimating | 244 | Deaths in the Industry | 304 |
| Calendar of Events | 88 | Drilling Contractors | 249 | Statistical Summary | 305 |
| Journally Speaking | 95 | New Equipment | 254 | Drilling Statistics | 306 |
| Editorial | 97 | Trade Literature | 266 | Supply Statistics | 307 |
| Watching Washington | 107 | Equipment Men in the News | 272 | Refining Statistics | 308 |
| Foreign News | 119 | Exploration Highlights | 283 | Markets | 309 |
| Book Review | 230 | Successful Wildcats | 295 | Classified Advertising | 310 |
| Refiner's Notebook | 243 | Personals | 301 | Advertisers' Index | 315 |

# NEW...

# Fairbanks-Morse Positive Displacement Axial-Flow Rotary Compressor

**Combines the best features of reciprocating and centrifugal compressors**

Consider the advantages of the all-new Fairbanks-Morse two-impeller, helical-lobe type, axial-flow rotary compressor:

1 **Delivers oil-free air or gas with low ratios of unit weight and space to capacity.**

2 **Exhibits high efficiencies and positive-displacement stability of flow at varying compression ratios and speeds.**

**Result:** Ideal performance from a relatively small compressor that is mechanically simple, flexible in application, adaptable to any power source; a compressor that provides stable performance, smooth operation, and variable-capacity control.

This all-new F-M Compressor is available in 5 standard case and impeller sizes, single-stage and multi-stage units—for pressure, vacuum or booster service. Capacities range from 800 to 13,000 cfm.—also higher or lower if desired, on custom-designed basis. Contact your Fairbanks-Morse branch for further information, or write directly to Fairbanks, Morse & Co., 600 So. Michigan Ave., Chicago 5, Illinois.

**Ask for new illustrated bulletin ACO 100.1 giving typical performance characteristics and other important data.**

**FAIRBANKS-MORSE**

***a name worth remembering when you want the BEST***

COMPRESSORS • ELECTRICAL MACHINERY • DIESEL AND DUAL FUEL ENGINES • DIESEL LOCOMOTIVES • RAIL CARS • PUMPS • SCALES • HOME WATER SERVICE EQUIPMENT • MAGNETOS

# How to *INCREASE BOILER RATINGS*

## with your present furnace and stack

***Coppus-Dennis FANMIX Burners Give You More Heat with No Other Major Change in Equipment***

Coppus-Dennis **FANMIX** Burners give you *perfect* mechanical mixing of fuel and air *at the burner outlet . . . instantaneous* ignition close to the burner . . . and *complete* combustion *without visible flame* when burning natural gas. No other burner combines these three advantages.

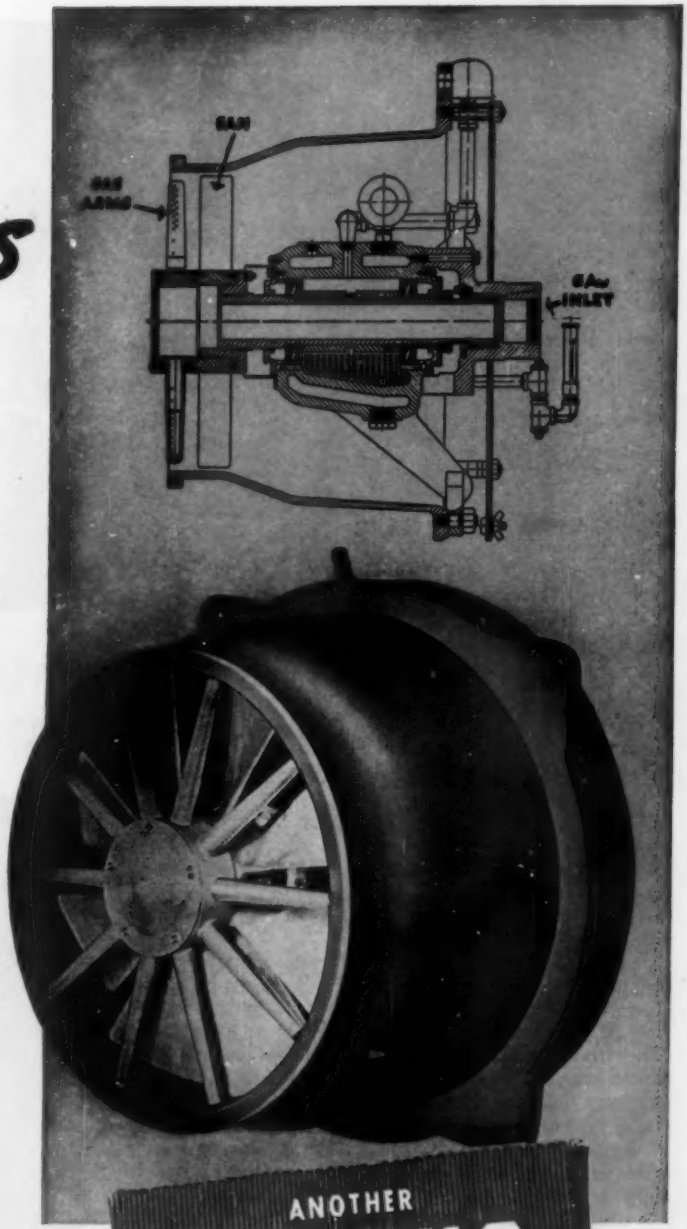
Because **FANMIX** delivers the *right* mixture of fuel and air *without blow-torch action*, all of your furnace space is used for combustion . . . *none for mixing.* That's why your present furnace can release more heat . . . why new installations can get more heat out of smaller furnace space.

Because **FANMIX** can be guaranteed to secure complete combustion of natural gas *with less than 5% excess air*, you get uniform "radiant heat" *without drifting hot spots.* That's why a **FANMIX**-fired furnace seldom varies in temperature more than 5% over its entire area.

### WRITE FOR ALL THE FACTS

When you see in Bulletin 410–6 how fuel escaping from orifices in rotating driver arms rotates the fan to draw the correct proportion of air into the path of the fuel at right angles . . . how **FANMIX** creates its own forced draft, reduces stack requirements, prevents cracking of "wet" gas . . . how two **FANMIX** types handle either gas or oil or any combination of both — you'll understand why **FANMIX** Burners have such wide acceptance in oil refineries and power plants.

Send for the Coppus-Dennis **FANMIX** Bulletin 410–6. Coppus Engineering Corporation, Worcester 2, Mass. Sales Offices in THOMAS' REGISTER. Other Coppus "Blue Ribbon" products in BEST'S SAFETY DIRECTORY, CHEMICAL ENGINEERING CATALOG, and REFINERY CATALOG.




ANOTHER
**COPPUS**
"BLUE RIBBON" PRODUCT

COPPUS ENGINEERING CORP.
270 Park Ave., Worcester 2, Mass.

Please send Bulletin 410–6 to:

Name .....

Company .....

Address .....

# Let Wilson-Snyder Engineers help you plan for SLURRY PUMPING

ALTHOUGH the pumping of slurries continues to present specific problems for every project, Wilson-Snyder has, for many years, been building pumps which excel in that kind of service.

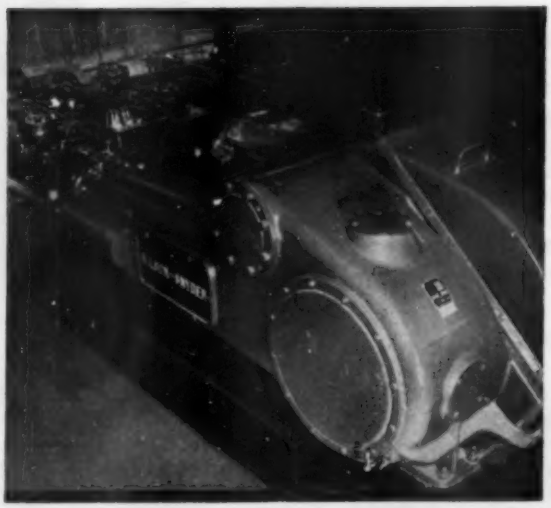
Most noteworthy among our recent experiences in transportation of solids through pipelines, in slurry form, are these two well-known installations. We furnished the pumps for American Gilsonite Company's line from Bonanza, Utah to Gilsonite (near Grand Junction, Colorado), and also for Pittsburgh Consolidation Coal Company's line from Cadiz, Ohio to Cleveland, Ohio.

Fortified with much practical experience, Wilson-Snyder pump engineers know the basic problems in applications of this type and are more than willing to discuss them with you. We can give you valuable assistance in the application of slurry pumping equipment and show you the outstanding features of Wilson-Snyder pumps that are available for a wide range of displacements, working pressures, and fluid-end designs and materials.

Of course you'll want specialized engineering assistance for installing any slurry pumping project, but during the planning stages it just makes good sense to take advantage of our experience and testing facilities. Just write to:

**Wilson-Snyder Works, Oil Well Supply Division of United States Steel, Braddock, Pa.**

*USS and Wilson-Snyder are trademarks*

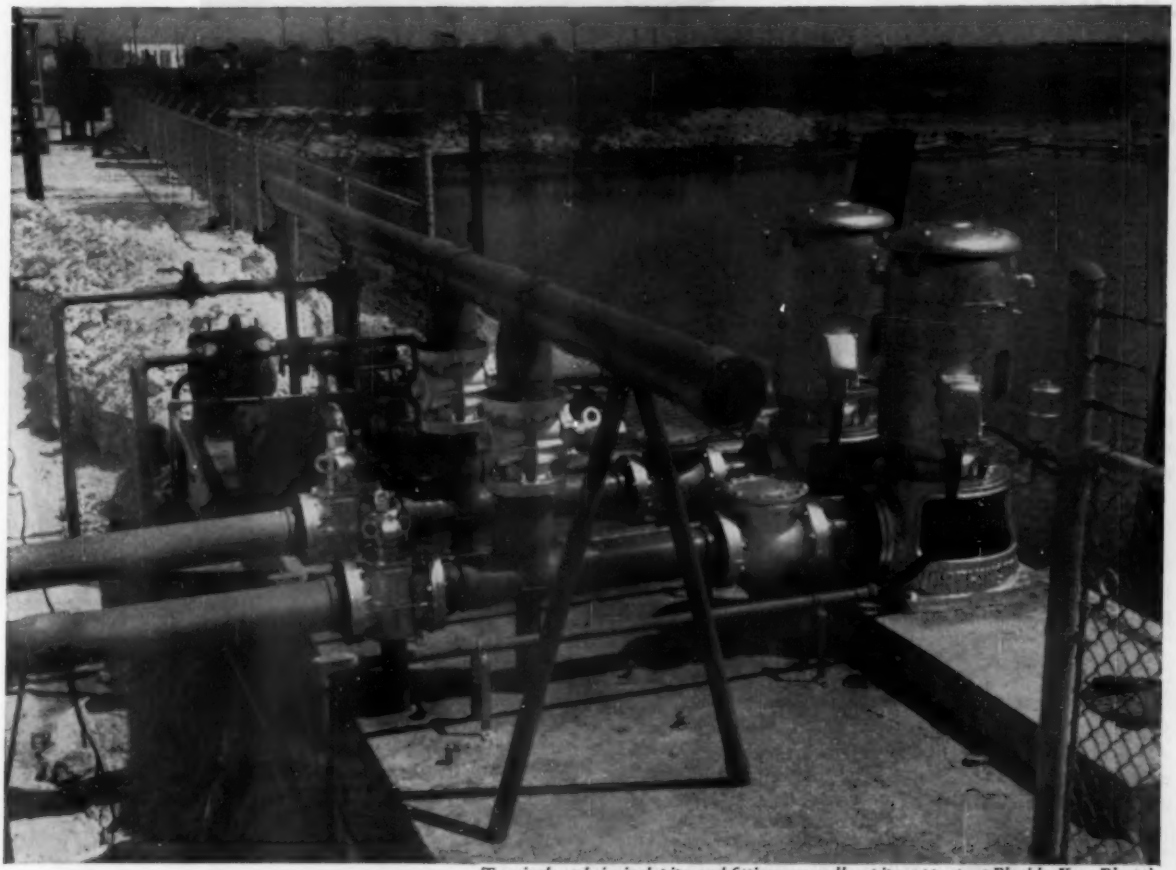


**AMERICAN GILSONITE COMPANY'S pumping station at the Bonanza, Utah mines relies upon three (two operating, one stand-by) Wilson-Snyder heavy-duty plunger pumps to move 630 tons of Gilsonite per day through the 72-mile pipeline for processing near Grand Junction, Colorado. Each pump is powered by a 300-hp motor and the system is capable of handling 325 gpm of slurry at 2200 psi.**

**Wilson-Snyder Works**
**Oil Well Supply Division**
**USS United States Steel**

*News about*

# B.F.Goodrich Chemical *raw materials*



*Two-inch and six-inch pipe and fittings, as well as pipe supports at Florida Keys Electric Cooperative, Marathon, Florida, are made from Geon rigid vinyl. B.F.Goodrich Chemical Company supplies the rigid vinyl material only.*

## Pipe of Geon cures corrosion caused by ground currents

SEA water is used in the raw water system of this diesel generating plant, and electrolytic corrosion of the metal piping in the raw water system created quite a problem. Then pipe made from Geon rigid vinyl was installed and, after two years of operation, there is no corrosion problem in the piping handling the sea water.

The addition of a larger diesel unit to the plant now calls for six-inch pipe made from Geon rigid vinyl to handle the salt water used in cooling the diesels and lubricating oils, and for piping Bunker C fuel oil from the oil storage tanks to the plant. Even the pipe supports are made from Geon rigid vinyl.

Pipe of Geon is the logical choice wherever corrosion causes problems. And there are installation savings, too. Pipe of Geon is lightweight and easy to handle. Contractors like it. Can be readily joined by solvent welding or standard threaded fittings.

How can you benefit from pipe made of Geon rigid vinyl? Get information by writing Dept. LL-5, B.F. Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

**B. F. Goodrich Chemical Company**
**a division of The B.F.Goodrich Company**

SEE US AT BOOTH NO. 509
9TH NATIONAL
PLASTICS
EXPOSITION
NOV. 17-21
INT'L AMPHITHEATRE—CHICAGO

B.F.Goodrich

GEON polyvinyl materials • HYCAR American rubber and latex
GOOD-RITE chemicals and plasticizers • HARMON colors

# SELECTION IS PRIMARY...

## SPECIFY HALLIBURTON

*for your next primary cementing job*

**COST:** Casing is always a major expense in drilling and a casing job can only be as good as the cementing job that forms the bond between casing and formation. While drilling costs fluctuate because of varying completion depths, drilling programs and location problems, approximately 20% to 30% of the total drilling cost is invested in casing and cementing.

**CHOICE:** Your choice of the unequalled combination of Halliburton tools, techniques and products, provides the best service required for the most economical producing life of your well.

**EVALUATION:** Primary cementing programs should be carefully studied and planned to meet your specific well conditions... Halliburton provides the extra advantage of the world's most experienced corps of oil well cementers with technical "know-how" to help in evaluating your cementing program.

**SELECTION:** When you investigate all primary cementing techniques, only Halliburton, with its "more than a quarter of a century" know-how with the finest handling, pumping and placement equipment behind them, fills all your needs for primary cementing... you'll be right in specifying Halliburton, the world's most experienced cementing organization.

## HALLIBURTON TOOLS...

*ANOTHER IMPORTANT REASON FOR HALLIBURTON'S BETTER SERVICE:*

SUPER SEAL FLOAT SHOE

**SUPER SEAL FLOATING EQUIPMENT**

Each regular type Float Shoe Collar is equipped with a positive acting Super Seal Valve for extra protection while running, landing and cementing casing. This type valve provides *more than twice the sealing area* of conventional ball and seat valves for positive shut-off against back pressure from below. The special formula concrete used in all Halliburton Floating Equipment gives superior shock resistance and better guiding efficiency.

**CEMENT GUIDE SHOE**

Landing of the first joints of casing on bottom to be cemented may be hazardous, but greater safety results from the installation of a Halliburton Cement Guide Shoe. The strong, durable, rounded Guide directs the casing away from ledges, reduces sidewall caving, safely passes through crooked holes, and penetrates temporary bridges.

CEMENT GUIDE SHOE

## TURBO-JET SHOE AND GUIDE SHOE

These specially engineered tools not only float and guide casing strings to bottom, but provide a better distribution of cement and reduce channeling.

A built-in high speed rotor forces powerful jet-stream of fluid through side ports and bottom to agitate cement for more uniform cementing around casing. Jet-stream also "jets" off and washes mud-cake from the bottom and sides of the hole, prior to cementing, reducing possible contamination. The Turbo-Jet Float Shoe has a back pressure valve and gives maximium dependability even in deep hot holes.

## S-3 CASING CENTRALIZER

This tool with precision formed, heat-treated springs lap-welded to sturdy hinged end bands provides better casing centering and more uniform placement of cement around casing... reduces channeling... helps to eliminate future remedial costs. Specially designed Casing Centralizers of Heavy Duty and Slim Hole types are available for unusual well conditions.

## SELF-FILL DIFFERENTIAL COLLAR

Just *one* of these tools, placed in the casing string above a Super Seal Float Shoe or the top Float Collar, permits well fluids to fill the casing *automatically* as it is lowered into the well. Highly efficient in the deepest wells, even when drilling mud contains a high percentage of cuttings and lost circulation materials. The Self-Fill Differential Collar also provides an extra margin of safety and reduces the possibility of blowout... offers greater protection for weak formations... affords reduced running-in time for casing. The low 80 psi differential pressure maintained by the differential valve mechanism, between annulus and inside of the casing, reduces blowout hazard and possibility of formation damage caused by "ram-effect".

All of these features make the Halliburton Self-Fill Differential Collar the most dependable and versatile automatic casing fill-up device available.

TURBO-JET FLOAT SHOE

TURBO-JET GUIDE SHOE

S-3 CASING CENTRALIZER

SELF-FILL DIFFERENTIAL COLLAR

HALLIBURTON

CEMENTING SERVICES

HALLIBURTON OIL WELL CEMENTING COMPANY • DUNCAN, OKLAHOMA

"WORLD'S MOST EXPERIENCED OIL WELL CEMENTERS"

# Marsh Mastergauge

## ...the gauge that has everything!

**LEAK-PROOF ONE-PIECE CONSTRUCTION** from socket to tip of bourdon tube...accomplished by the exclusive Marsh "Conoweld" process.

**STURDY "MARSHALLOY" CASE** formed of boiler-plate thickness steel, copper clad inside and outside by "Marshalloy" process to give it all the durability and the corrosion resistance of solid copper with the dependable strength of steel.

**SUPERLATIVE "MASTERGAUGE" MOVEMENT** with exclusive "coined" sector gear, self lubricating, frictionless action and other refinements that add years to service life.

**TYPES FOR EVERY SERVICE**...wide range of bourdon tubes including stainless steels and monel. Full range of pressures, vacuum, compound gauges in endless sizes, case styles. Only Marsh has the "Safecase" for dangerous gauge applications.

"Mastergauge" is standard bearer for the broad line of Marsh Gauges fully covered in Catalog 76-G. All are available with the "Recalibrator" —best way to correct a gauge that has been knocked out of adjustment.

**MARSH INSTRUMENT CO.**
*Sales Affiliate of Jas. P. Marsh Corp.,*
**Dept. L, Skokie, Illinois**
Marsh Instrument & Valve Co., (Canada) Ltd.,
8407 103rd St., Edmonton, Alberta, Canada

**MARSH**
"THE STANDARD OF ACCURACY"

GAUGES • DIAL THERMOMETERS • REFRIGERATION INSTRUMENTS • HEATING SPECIALTIES

# Are you enjoying low-cost Macwhyte Wire Rope Service?

## Service Goes Up and Costs Go Down—

Macwhyte Wire-Rope Products* are industry's finest, most complete line of quality PREformed internally-lubricated Whyte Strand wire ropes, round-braided, flat-braided, and single-part wire-rope slings, Stainless Steel and Monel Metal wire rope, aircraft cable and swaged fittings, and "Safe-Lock" wire-rope assemblies. From this broad product group you can fill all your wire-rope needs with ropes of proved quality.

Whyte Strand Wire Rope is an easy product to handle in the field, and it's used by every industry. Why miss this cost-saving, easy opportunity to get the correct rope for all your equipment?

You get plenty of service, too, to help you save yearly rope costs. A widespread organization of wire-rope specialists is on hand to furnish field-application help . . . a superb wire-rope engineering group is available for technical assistance . . . and the products are enthusiastically recommended by all distributors.

Most important of all, we maintain large factory stocks, with complete handling and cutting facilities, as well as Mill Depots in support of distributor stocks, to guarantee you the fastest possible delivery.

Macwhyte's free service to you includes literature and catalogs which show the correct wire rope to use on all types of equipment.

Join the large, growing family of satisfied Whyte Strand wire-rope users — ask to have a Macwhyte representative call.

**MACWHYTE WIRE ROPE COMPANY**
**2916 Fourteenth Avenue, Kenosha, Wisconsin**

Manufacturers of Internally Lubricated PREformed Wire Rope, Braided Wire Rope Slings, Aircraft Cables and Assemblies, Monel Metal, Stainless Steel, Plastic Coated and Nylon Coated Wire Rope, and Wire Rope Assemblies. Special catalogs available.

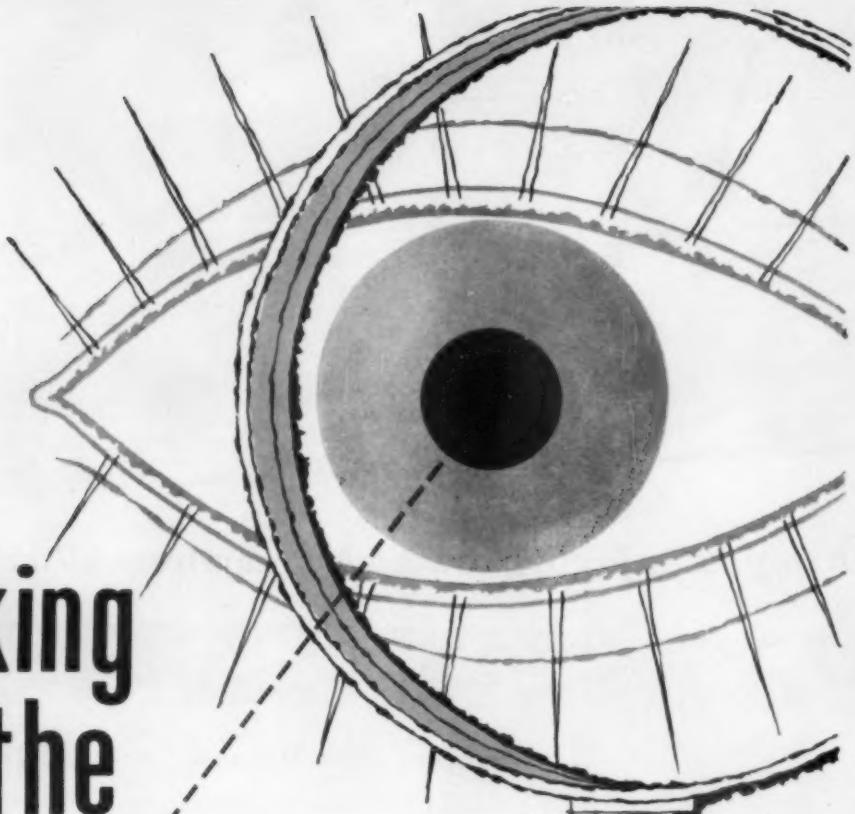
**MILL DEPOTS:** **New York 4,** 35 Water St. **Pittsburgh 36,** P. O. Box 10916, 353 Curry Hollow Road • **Detroit 3,** 75 Oakman Blvd. • **Chicago 6,** 228 S. Desplaines St. • **St. Paul 14,** 2356 Hampden Ave. • **Ft. Worth 1,** P. O. Box 605 • **Portland 9,** 1603 N. W. 14th Ave. • **Seattle 4,** 27 Holgate St. • **San Francisco 7,** 188 King St. **Los Angeles 33,** 185 S. Myers St.

**Visit us in Booth 130-131, Oklahoma Bldg. International Petroleum Exposition, May 14-23, 1959**

117

## MACWHYTE *Wire Rope* COMPANY

*Sold through distributors for more than 60 years.



# looking for the causes

## . . . wards off accidents

Helping you spot and eliminate hidden dangers is a specialty of the TEIA safety engineer. And this is just one of the ways that he helps you keep your work force at top productivity.

He will tailor a complete program to your specific needs bringing you the latest, most successful methods for defeating on-the-job accidents. This encourages top productivity, morale, loyalty and, best of all, contributes to the progress of your business while saving you money.

Get a specialist on your team. Call your Texas Employers' representative now for details of this professional service.

SERVICE OFFICES

ABILENE • AMARILLO • AUSTIN
BEAUMONT • CORPUS CHRISTI
DALLAS • DALLAS (OAK CLIFF)
EL PASO • FORT WORTH
FREEPORT • GALVESTON
HARLINGEN • HOUSTON
LONGVIEW • LUBBOCK
MIDLAND • ODESSA • PORT ARTHUR • SAN ANGELO • SAN ANTONIO • SHERMAN • TYLER
WACO • WICHITA FALLS

## TEXAS EMPLOYERS INSURANCE ASSOCIATION

HOME OFFICE: EMPLOYERS INSURANCE BUILDING
DALLAS, TEXAS

AUSTIN F. ALLEN, *Chairman of the Board* BEN H. MITCHELL, *President*

*Stretch Dollars . . . Save Manpower with equipment that does more!*

# WORK BULL 202 with POWER-MATCHED AUBURN TRENCHER

## WILL DIG IN MORE ADVERSE CONDITIONS THAN ANY OTHER!

Here is a top-quality rig for digging utility lines, sewers, irrigation ditches, foundations, footings, laterals, gathering lines, and hundreds of other profitable jobs . . . and it's the best in the business when the going is really tough!

**TRACTOR AND TRENCHER FORM AN INTEGRATED DIGGING UNIT** with geared spacer of the Auburn Trencher built into the power train of your Work Bull 202. The Tractor is lengthened 3½", providing better balance and control for straight, smooth-walled trenching. ***Exclusive Gear-Draulic Drive*** lets you operate at speeds variable from zero to 600 feet per hour . . . automatically adjusts power to compensate for changing ground conditions. Complete control from the driver's seat facilitates fast, accurate digging with a minimum number of work interruptions.

**PATENTED NON-CLOGGING CUTTING BITS** have no pockets . . . do not fill with loosened dirt, nor jam under wet and clay conditions. Special chisel-type Pent-A-Bits in 5", 8", 11", and 14" widths are available for digging in rock, shale, or frozen ground that other equipment can't handle.

**VERSATILITY FOR WIDE RANGE USE!** Your Auburn Gear-Draulic Trencher travels from job to job at the road speed of your Work Bull 202 . . sets up fast in corners and other difficult locations. 190° vertical operating arc lets you dig straight down from the starting position or back-trench under sidewalks, streets, and other obstructions. You can dig 6", 8", 10", 12", and 14" widths in trenches up to 6' deep! Combined with a Davis Loader on the front of your Work Bull 202, one rig efficiently handles your complete digging/backfilling operations.

**OTHER MASSEY-FERGUSON POWER-MATCHED PACKAGES** include the Work Bull 1001 Multi-Purpose Tractor Loader (60.3 hp), Work Bull 303 Tractor (54.5 hp), Work Bull Fork Lift, and Davis Loaders and Backhoes . .. plus a multitude of integrated attachments for each basic unit.

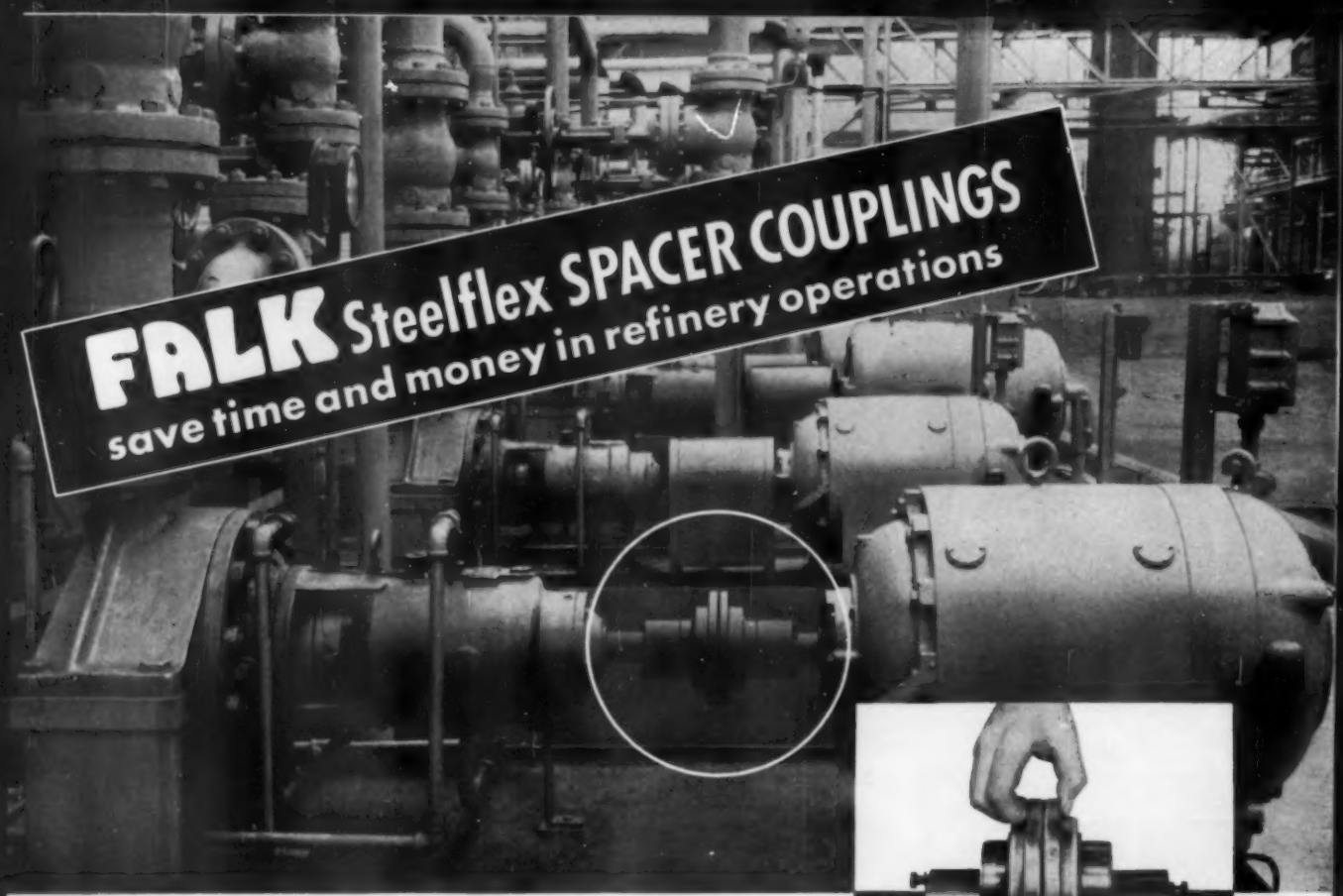
**For information on the complete Massey-Ferguson line ask for Brochure G-4. For specific information on the Work Bull 202 with Auburn Trencher, ask for Brochure A-2. Write Massey-Ferguson Industrial Division, 1009 South West Street, Wichita 13N, Kansas.**

Davis 210 Backhoe on Work Bull 202 or 303 . . . only machine that can dig flush alongside walls, etc.

Pipe and Cable Layer on Work Bull 202 buries lines up to 1½" dia. to a depth of 18½" at 2 to 3 mph.

Work Bull 1001 with Backhoe-Backfill Blade handles excavating, filling without changing attachments.

**MASSEY-FERGUSON**
**INDUSTRIAL DIVISION**



# FALK Steelflex SPACER COUPLINGS
## save time and money in refinery operations

## Cut disconnect-reconnect time by as much as 50%

The FALK Spacer Coupling is specially designed for quick installation or removal *without disturbing the driving or driven unit.* This feature can save you up to 50% in disconnect-reconnect time when critical equipment—a process pump, for example—needs repair or replacement.

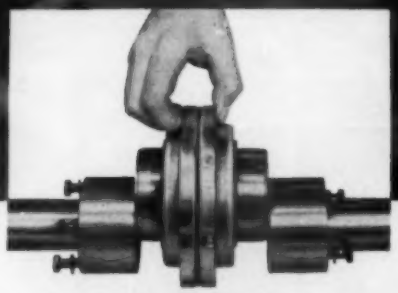
Here's another saving: with the FALK Spacer Coupling, you can quickly realign shafts *without the usual loss of operating temperature!*

And still another: you can remove or reinstall the FALK Spacer as a unit *without draining the lubricant.*

Because of its exclusive grid-groove Steelflex design, the FALK Spacer can accommodate residual misalignment—parallel, angular, or (most important) *both.* Also, it provides torsional resiliency that cushions shock and vibration. Thus it saves wear-and-tear on your connected equipment.

To prove these claims and enjoy these savings, install a FALK Spacer on one application—and see for yourself. Consult your FALK Representative or Authorized Distributor.

**THE FALK CORPORATION, MILWAUKEE 1, WISCONSIN**
*MANUFACTURERS OF QUALITY GEAR DRIVES AND FLEXIBLE SHAFT COUPLINGS*
**Representatives and Distributors in many principal cities.**

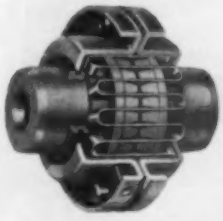


### EASY AND QUICK TO INSTALL, DISCONNECT OR RECONNECT

First, mount shaft hubs to allow proper distance between hubs; then, align driving and driven units.

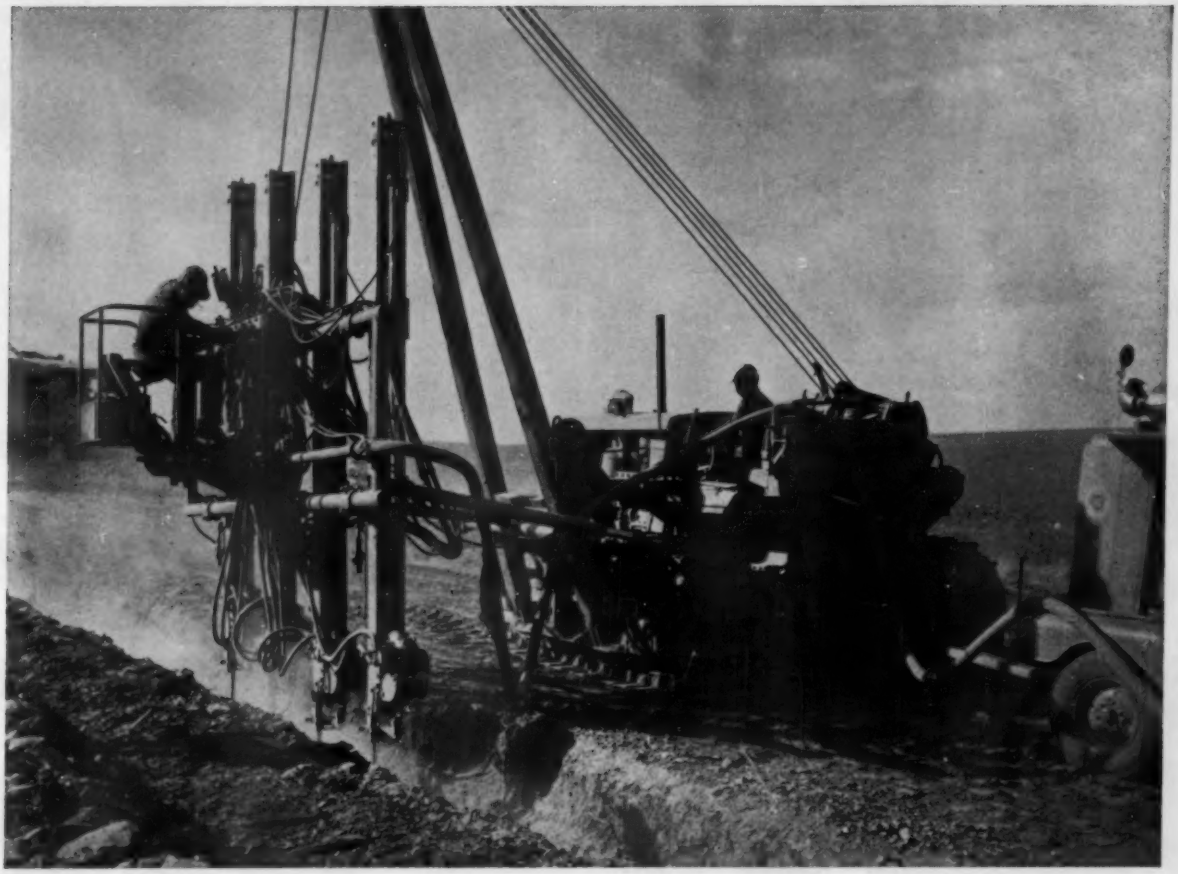
Second, compress Spacer to fit space between hubs and tighten cap screws to pull spacer hubs into the registered fit.

To disconnect, reverse the second step. No draining of lubricant necessary.



**The heart of the FALK Spacer ...the basic Type F Steelflex**
*Write for Service Manual 4838*

**FALK**
...a good name in industry

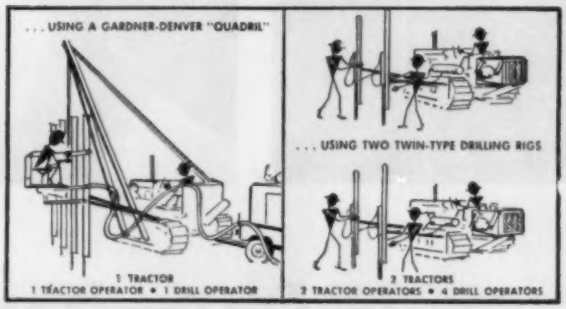


# Gardner-Denver "Quadril" saves four men . . . one tractor

Fast blast holes, four at a time, with one man doing the work—that's what the "Quadril"* means in trenching rock. All four of the "Quadril's" fast-acting, heavy-duty rock drills are operated by hydraulic remote control—at the finger-tip command of one operator. Thus, the "Quadril" eliminates three drillers, tractor and tractor operator required for twin-drilling methods. Write for bulletin.

* Trade Mark

What it takes to drill four blast holes


. . . USING A GARDNER-DENVER "QUADRIL"
1 TRACTOR
1 TRACTOR OPERATOR • 1 DRILL OPERATOR
. . . USING TWO TWIN-TYPE DRILLING RIGS
2 TRACTORS
2 TRACTOR OPERATORS • 4 DRILL OPERATORS

ENGINEERING FORESIGHT—PROVED ON THE JOB
IN GENERAL INDUSTRY, CONSTRUCTION, PETROLEUM AND MINING

## GARDNER-DENVER

Gardner-Denver Company, Quincy, Illinois
In Canada: Gardner-Denver Company (Canada) Ltd., 14 Curity Ave., Toronto 16, Ontario
Gardner-Denver Export Division, 233 Broadway, New York, N. Y.
Oil Field offices: Dallas, Houston, Tulsa, St. Louis, Los Angeles, New York, Pittsburgh, Denver, New Orleans, Durango, San Francisco, Kansas City, Winnipeg, Edmonton

# *It's always perfect "coating*



There's a PLS plant strategically located to serve YOU!

# *weather" in a PLS plant!*

Under the roof—out of the open air—is the best possible climate for *controlled* pipe protection. It isn't simply a case of being able to continue production in spite of rain . . . but rather the cleaning, priming, coating and wrapping of pipe under *controlled conditions:* where machinery can be more elaborate and more carefully synchronized . . . where dust and open field debris can't cause a lack of quality and uniformity . . . where visual and mechanical inspection is far more accurate.

Perfect "coating weather" and *controlled protection* are now available to you in *eight* completely equipped Pipe Line Service plants. They're strategically located across the country, from Monmouth Junction, N. J., to the brand-new plant at Provo, Utah. Big acreage is provided for your convenience—and so that the *delivery date you specify is the date we meet.*

Call in your nearest Pipe Line Service representative. He can show you how to get the highest possible return on your pipe-protection investment.

Also Sales Offices at
Atlanta, Georgia — Lincoln, Nebraska
Tulsa, Oklahoma — Houston, Texas

PIPE LINE SERVICE CORP. SERVICE FRANKLIN PARK, ILL.

## *Pipe Line Service Corporation*

FRANKLIN PARK, ILLINOIS

*Quality pioneers in coating and wrapping pipe for a quarter century*

A SUBSIDIARY OF AMERICAN STEEL FOUNDRIES

## open motors for extreme conditions

# Save up to 60%!

Here's an amazing advance in motor technology! It's the *Super-Seal* motor line — an open motor design so completely unaffected by moisture, dust, dirt, oil, acids and alkalis that it can be used in many applications previously requiring more costly enclosed motors. *Savings range from 15 to 60%.*

*Super-Seal* motor superiority results from revolutionary insulating techniques. Available in any integral horsepower size, smaller *Super-Seal* motors incorporate an encapsulated stator. A durable epoxy resin encloses the stator, creating an electrical system impervious to outside elements.

**In larger sizes,** *Silco-Flex* insulation is used. In this system, silicone rubber is vulcanized into a homogeneous mass to form a flexible, moisture and heat resistant, void-free dielectric barrier around coils and leads.

Both of these insulation systems are unsurpassed. Proof? An encapsulated motor ran for hundreds of hours at full load in a 4% brine solution.

**Find out more** about new economies in motors from your A-C representative or distributor, or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin. *Silco-Flex and Super-Seal are Allis-Chalmers trademarks.*

**ALLIS-CHALMERS**

A-5802

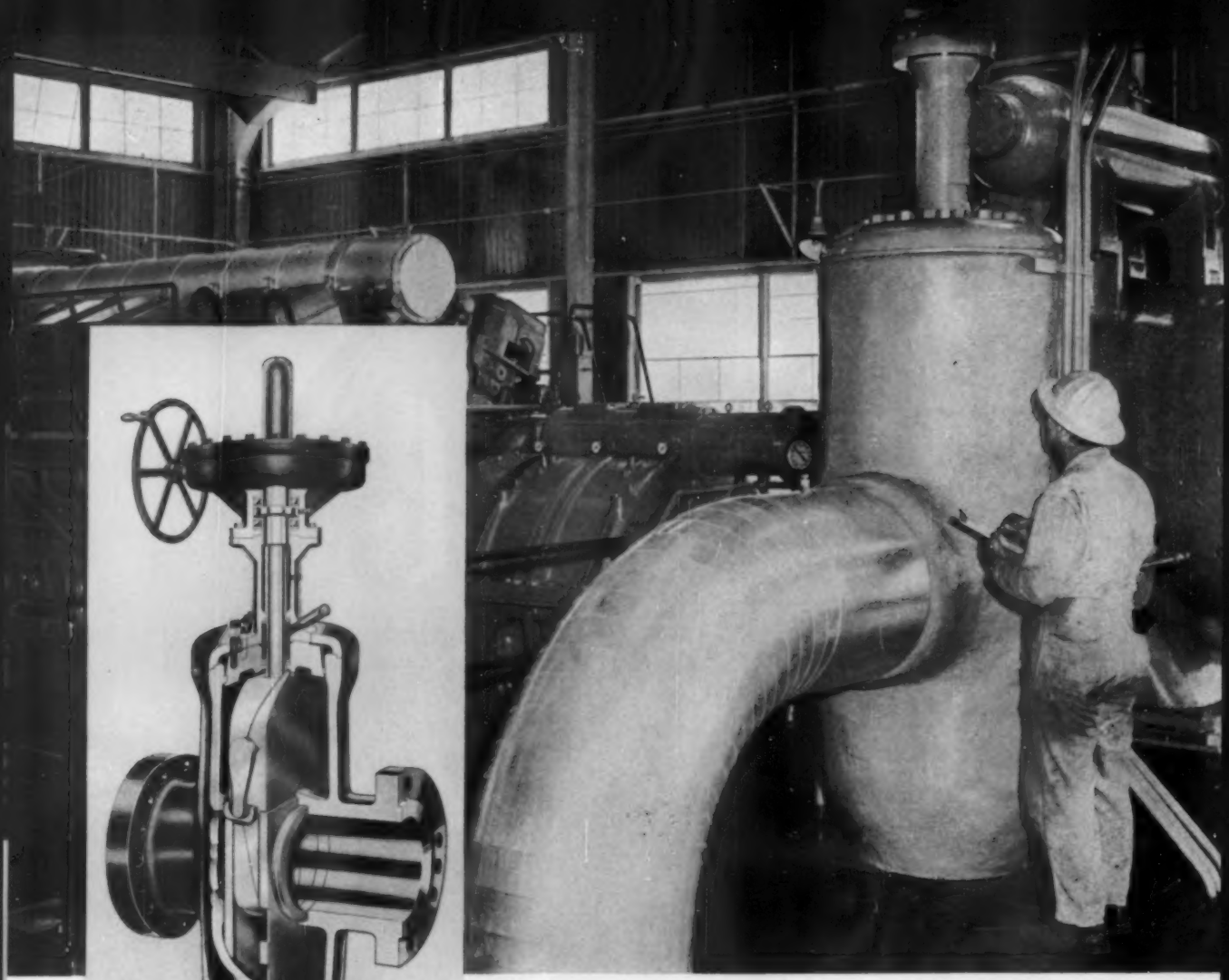
*"A far greater use of energy throughout the world is absolutely necessary if the living standards of millions of people are to be raised substantially. Furthermore, it seems likely that a large part of this energy is going to come from petroleum. I do not underestimate the potentialities of coal and the unexplored possibilities of the atom. But it does seem certain that higher standards of living and the security of the free world will depend upon energy from oil for the foreseeable future."*

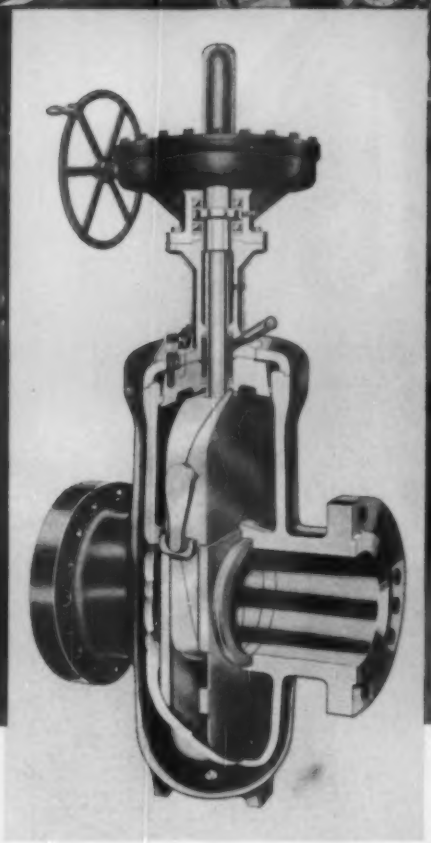
*Eugene Holman, Chairman of the Board, Standard Oil Company (New Jersey)*

ESSO

**STANDARD OIL COMPANY (NEW JERSEY)**

AND AFFILIATED COMPANIES





## W-K-M's *Creative Engineering*

# sets the standards for pipeline valves around the world

From 2-inch to 34-inch, W-K-M's ASA gate valves have earned the commendation of pipeliners from California to Iran, from Peru to Canada.

And why not?

No other pipeline valves are so carefully engineered to meet the practical requirements of pipeline service. No other valves will give you the same performance, the same long life, the same long-range economy. No other valves can be so easily or quickly overhauled "on-the-line."

For complete dependability, specify W-K-M when you requisition valves.

### The W-K-M® ASA Gate Valve can be overhauled "on-the-line"

W-K-M designed this valve to save you time and money. W-K-M valves give you longer service between overhauls, and when overhaul is necessary, you can do the job while the valve is *on-the-line*. This one feature saves users of W-K-M valves thousands of dollars each year.

**Other features include:** Full bore through-conduit; exclusive gate centralizing mechanism; freedom from destructive turbulence; no-surge operation; free passage for pigs or scrapers.

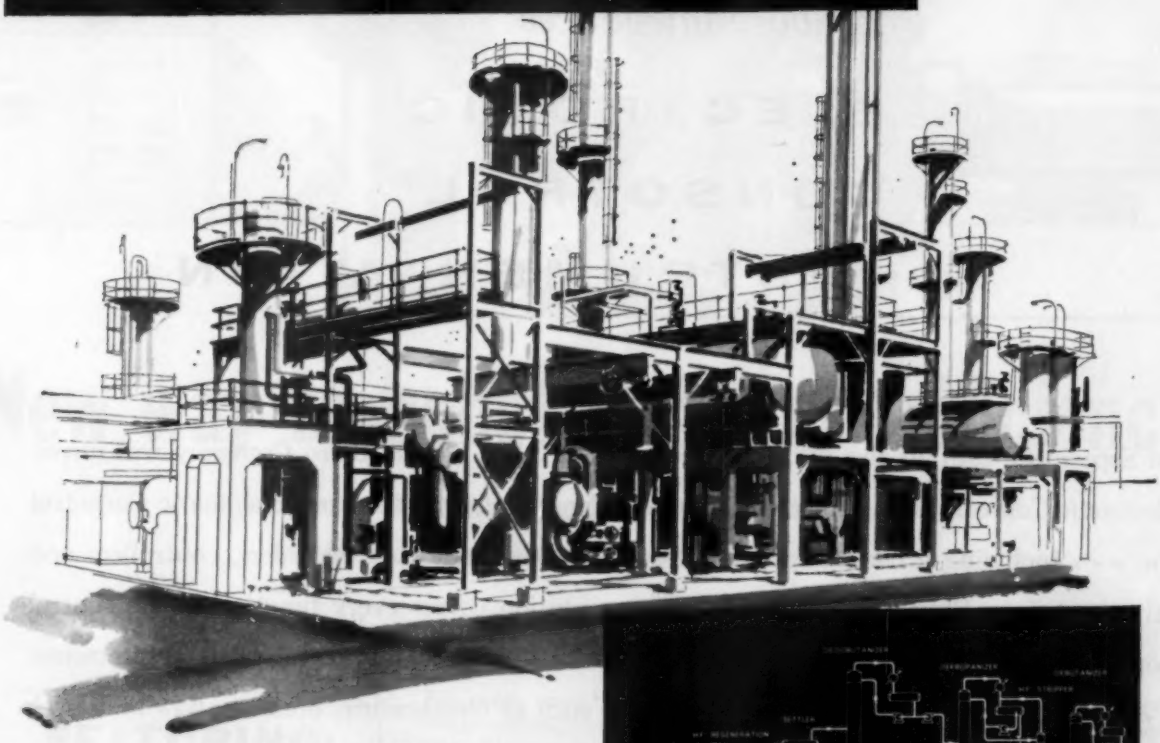
WRITE FOR CATALOG 300

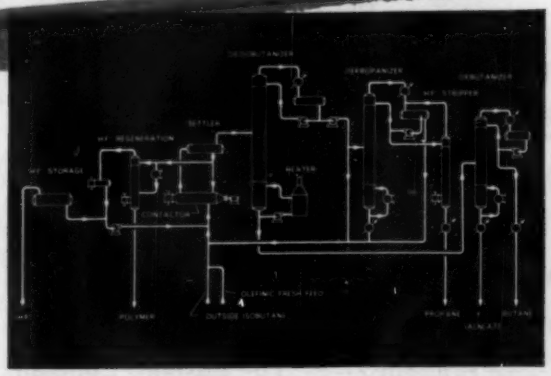
**W-K-M**

DIVISION OF ACF INDUSTRIES
INCORPORATED
P. O. BOX 2117, HOUSTON, TEXAS

5813

# HF Alkylation





## Makes Alkylate, Top Anti-Rumble Motor Fuel

A practical, economical means of producing motor alkylate, a high octane, top quality gasoline blending component, is available to petroleum refiners through the UOP "HF" Alkylation process.

"HF" Alkylation is a catalytic process which combines olefins such as propylene, butylenes and amylenes with isoparaffin (usually isobutane) to form a mixture of branched chain hydrocarbons of higher molecular weight known as alkylate. "HF" Alkylation is also widely used for producing high octane aviation gasoline.

Motor alkylate, an isoparaffin fuel component, burns with a minimum of carbon deposits even in today's modern high compression automobile engines and thus greatly reduces surface ignition and its consequent "rumble."

Another method for producing alkylate is also available to refiners through UOP. It is similar to the "HF" method but uses sulfuric acid as the catalyst. This process is licensed by Universal Oil Products Company under their own patent rights and the patent rights of Shell Oil Company, The Texas Company, The British Petroleum Company, Limited and Standard Oil Company of New Jersey.

These processes for producing alkylate afford further evidence of UOP's policy of providing the refining industry with every means for a well-rounded, profitable manufacturing operation.

UOP®

**UNIVERSAL OIL PRODUCTS COMPANY**

**30 Algonquin Road, Des Plaines, Illinois, U.S.A.**

*More Than Forty Years Of Leadership In Petroleum Refining Technology*

*Foxboro introduces*

# ELECTRONIC CONSOTROL* INSTRUMENTATION

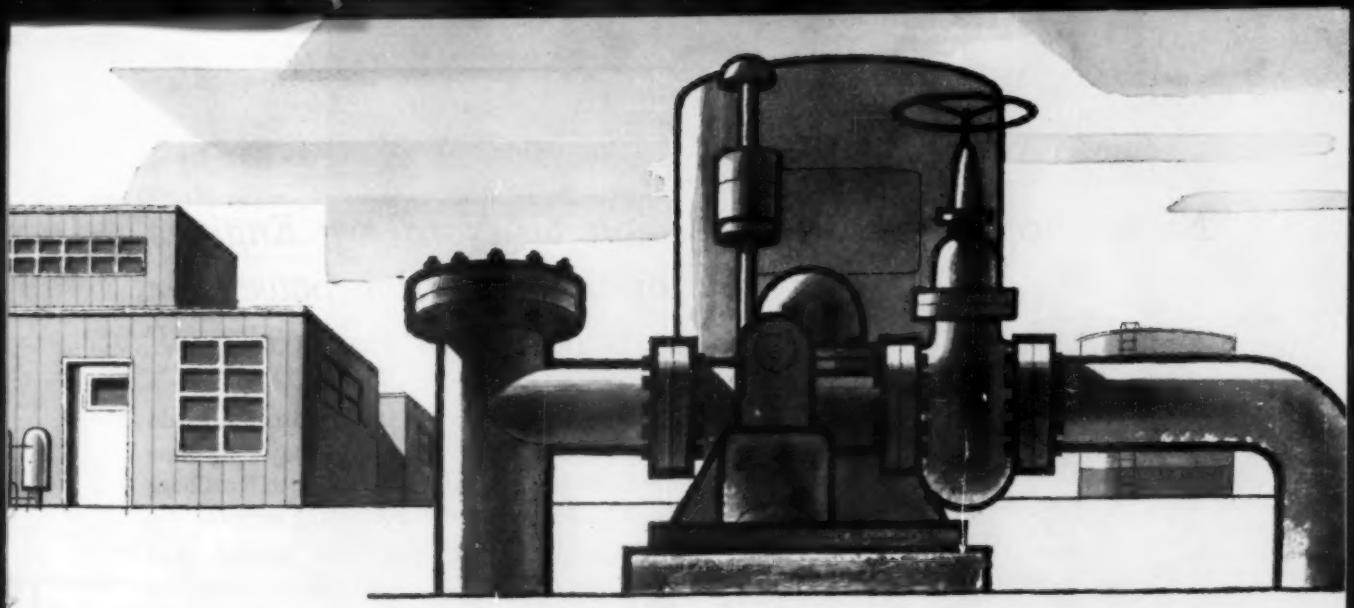
On September 15th, at the I.S.A. Show in Philadelphia, The Foxboro Company will unveil Electronic Consotrol Instrumentation...counterpart of its world-famous pneumatic Consotrol line. ✓ ✓ ✓ Including a complete range of transmitters, indicators, recorders, controllers and valve operators, Electronic Consotrol Instrumentation covers every function in the control loop...provides advanced-design electronic control systems for all modern requirements. ✓ ✓ ✓ In these systems, process measurements such as temperature, pressure, flow and level, are converted to a proportional current signal at the transmitter. Long-distance transmission is instantaneous...over unshielded lines...to small-case, Consotrol panel-type receivers at the central control station. ✓ ✓ ✓ The full story on this major Foxboro contribution to better process control will be presented in Booth No. 12-72 at the I.S.A. Show. Or, write for comprehensive Bulletin 21-10. The Foxboro Company, 609 Neponset Avenue, Foxboro, Mass.

*Reg. U.S. Pat. Off.

FOXBORO

REG. U.S. PAT. OFF.

*Foxboro makes a better instrument...*
*or Foxboro doesn't make it*



# New way to boost pumping efficiency

## Control unmanned booster stations with new packaged control system

Designed by the pipeline industry for the pipeline industry

**FEATURING:**

- **Protection from error**
- **Unmatched reliability**
- **Easy expandability**
- **Modular construction**
- **Economy**

**For years, now,** Union Switch & Signal has been designing custom supervisory control systems to solve individual problems for pipeline companies. Out of this experience has come a realization of your requirements and the need for a simple standardized system capable of easy expansion . . . with the lower-cost advantages of package design being passed on to you. That system is now available.

This new modular control system concentrates all apparatus for the supervisory control of a station on two 19″-wide racks. One rack goes in the controlling office, the other at the field location being controlled. It provides display of indications and alarms and can easily be adapted to handle telemetering and other data. Future additions or changes to the system can be made without changing the basic circuits.

### Security as well as conventional reliability

Rugged, industrial-type control components—designed and built by Union Switch & Signal itself—give this system the reliability you need in pipeline operation. But it goes further than mere reliability. Like other UNION Control Systems, this new system checks itself against error before implementing a control.

It is coded so that noise or distortion cannot operate the field equipment. It checks this code to insure correct operation. It immediately gives an indication if a communication failure occurs at any time.

This is the system you need to insure fail-safe operation. It is the system you need to trim the cost of single station controls. Write for complete information. And watch for future standardized systems now being developed by Union Switch & Signal.

*"Pioneers in Push-Button Science"*

**UNION SWITCH & SIGNAL**

DIVISION OF WESTINGHOUSE AIR BRAKE COMPANY

PITTSBURGH 18, PENNSYLVANIA

*"Experience proves we can count on Nordberg Engines for low cost pipeline power for crude, products or natural gas"*

These words are representative of the comments made by management and operating personnel of major pipeline companies in reference to the service they get with Nordberg engines for pipeline pumping and compressing service.

Hundreds of pipeline installations have proved that Nordberg Diesel, Duafuel® and Spark-Ignition Gas engines can be counted on to deliver efficient, low cost, long-term power for 'round-the-clock operations . . . on crude, products and natural gas pipelines.

*"... and we depend on Nordberg Diesels to keep our tankers on schedule"*

In Marine operations, too, Nordberg engines are the logical choice for reliable, low cost power . . . as evidenced by statements made by experienced tanker skippers, and other petroleum transportation personnel who have learned to depend on the "on-schedule" performance of Nordberg Diesels.

These powerful marine engines are widely used for both main propulsion and auxiliary service in tankers of all sizes, from small Great Lakes vessels, up through Coastal and Ocean-going tankers flying the flags of many companies and many nations.

*Backed by this broad experience and proved performance, Nordberg engines are your best investment for low cost, long-term power . . . in sizes from 600 to over 11,000 horsepower. We will welcome your inquiry and the opportunity to discuss the application of Nordberg engines with you.*

© 1958, Nordberg Mfg. Co.

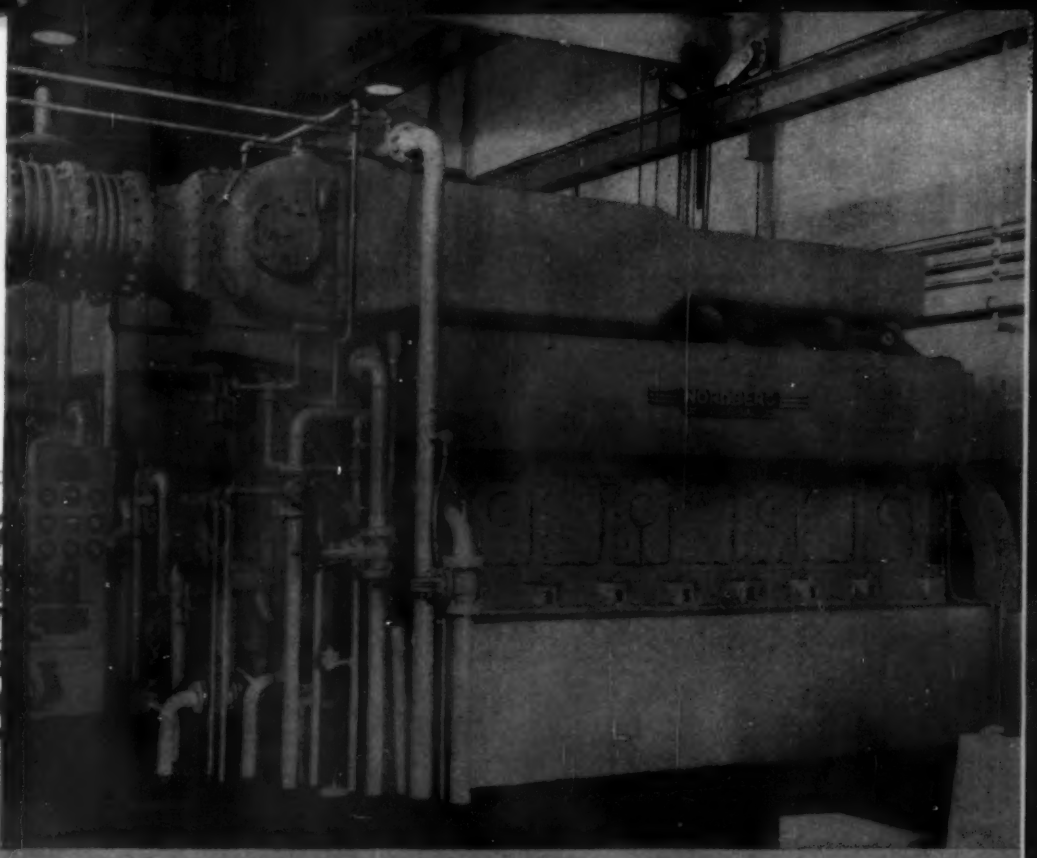
**NORDBERG**

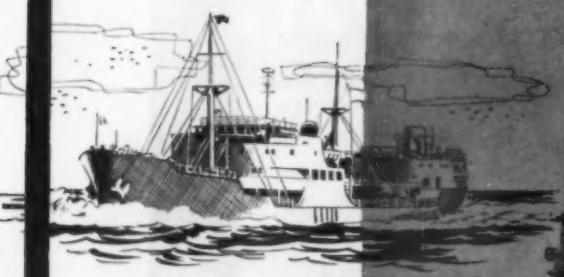
DIESEL • DUAFUEL® AND SPARK-IGNITION GAS ENGINES

O658

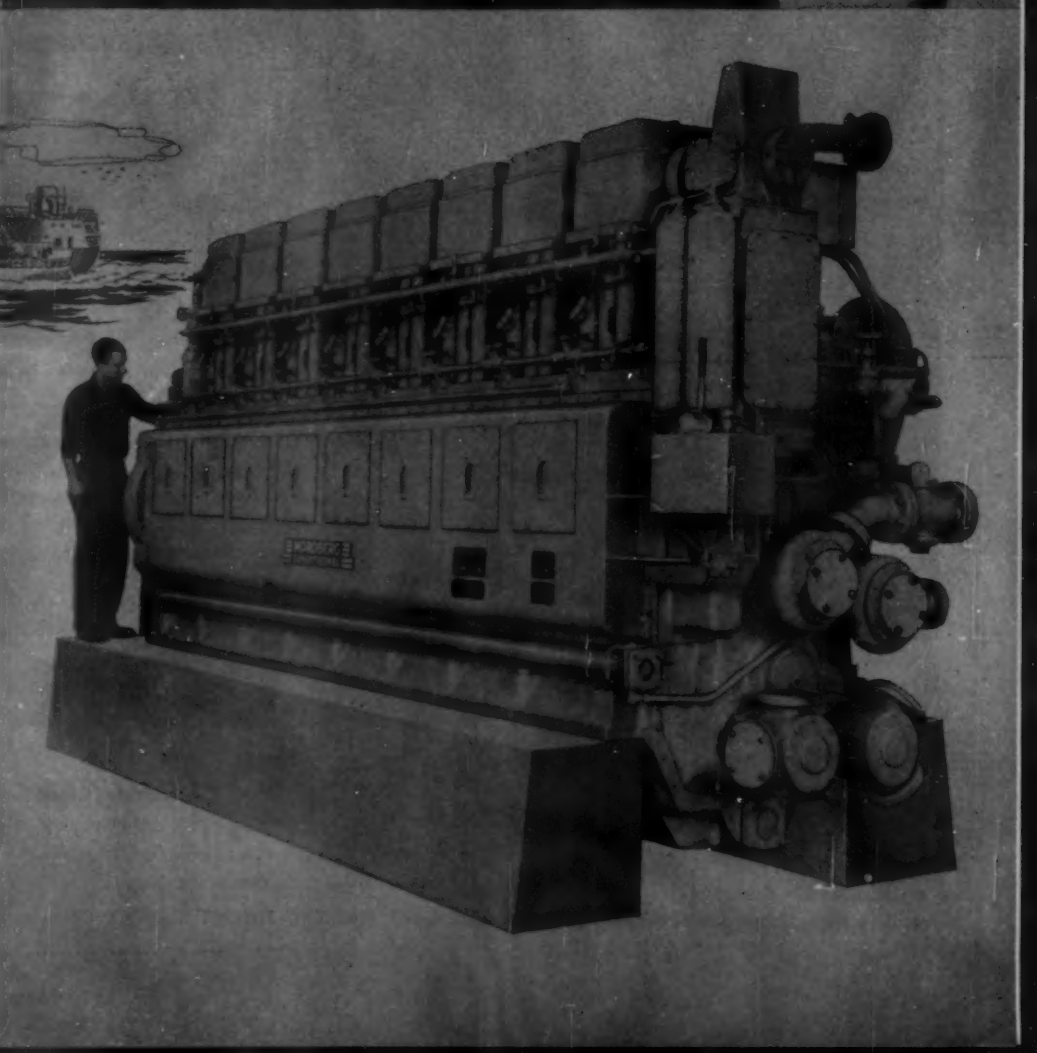
**NORDBERG MFG. CO., Milwaukee, Wisconsin**

These 2000 hp *Supairthermal®* pipeline engines have been in operation over 20,000 hours with extremely low maintenance. They are part of a total of 24 Nordberg engines to be installed along the Trans Mountain Pipe Line from Edmonton, Alta., to Vancouver, B.C.

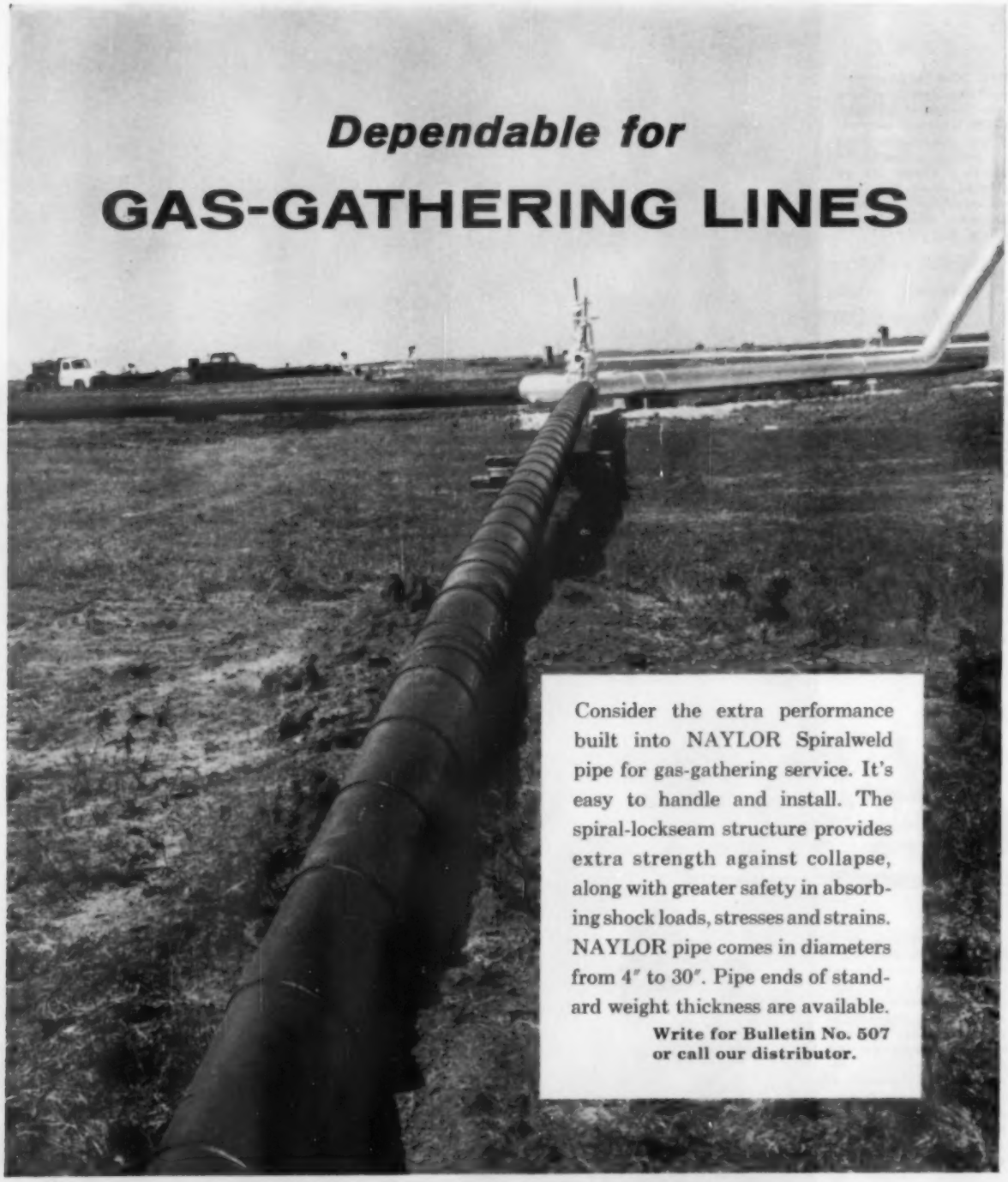




Nordberg two and four-cycle In-line and V-type Diesel Marine Engines are being used in increasing numbers for dependable main propulsion of both new and repowered tankers serving numerous oil companies here and abroad. Four-cycle Diesels are built in sizes to 4500 hp, and two-cycle units in sizes to over 11,000 hp in a single engine.



**Builders of America's Largest Line of Heavy Duty Engines**



*Dependable for*

# GAS-GATHERING LINES

Consider the extra performance built into NAYLOR Spiralweld pipe for gas-gathering service. It's easy to handle and install. The spiral-lockseam structure provides extra strength against collapse, along with greater safety in absorbing shock loads, stresses and strains. NAYLOR pipe comes in diameters from 4″ to 30″. Pipe ends of standard weight thickness are available.

**Write for Bulletin No. 507 or call our distributor.**

# NAYLOR PIPE *Company*

1232 East 92nd Street, Chicago 19, Illinois

**Eastern U. S. and Foreign Sales Office:** 60 East 42nd Street, New York 17, N. Y.

EXCLUSIVE DISTRIBUTORS IN MID-CONTINENT AND GULF COAST AREAS: **MID-CONTINENT SUPPLY CO.** • Fort Worth, Texas and Branches

Ten AAF Cycoils deliver clean air to the 660 hp. engines driving pumps at the Ward-Estes Water Flood Project.

# AAF Cycoils protect engines—require minimum maintenance

When engines are driving pumps for high-volume water injection used in secondary recovery, down-time means decreased production. That's why only the best protection against dust and dirt is good enough. At the Ward-Estes Water Flood Project, Ward County, Texas, ten AAF Cycoils do the job.

AAF Cycoil oil bath air cleaners require an absolute minimum of maintenance. It is not necessary to tear them down for cleaning. Due to self-cleaning action of the filter pads, the only maintenance needed is the periodic replacement of oil. Records show that Cycoils have been on the job in some applications for as long as 20-years without being dismantled for maintenance.

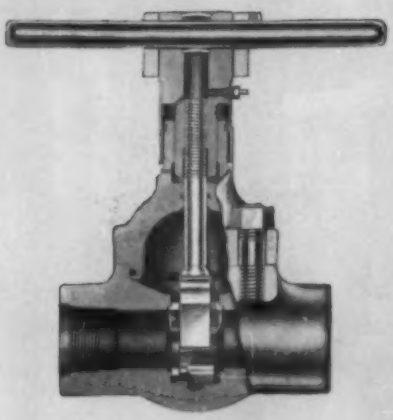
Cycoils offer many advantages—uniform air delivery, constant efficiency, low operation resistance, minimum maintenance. Get all the facts on AAF Cycoil oil bath air cleaner right away. Write today for Bulletin 130.

AAF American Air Filter COMPANY, INC.

444 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.

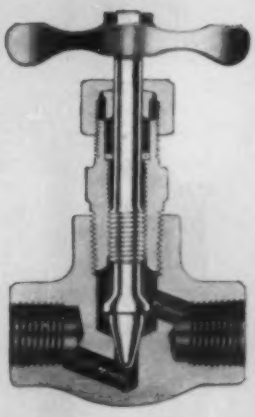
BETTER AIR IS OUR BUSINESS

# Rockwell-Built Edward Steel

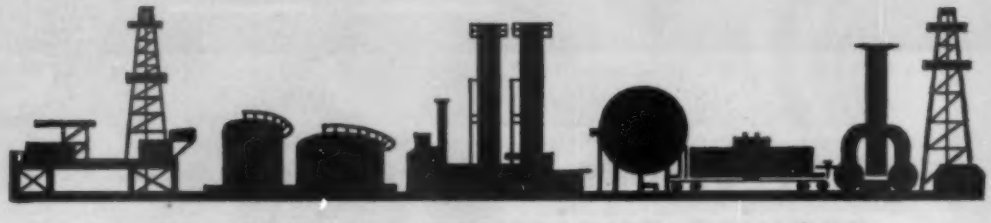


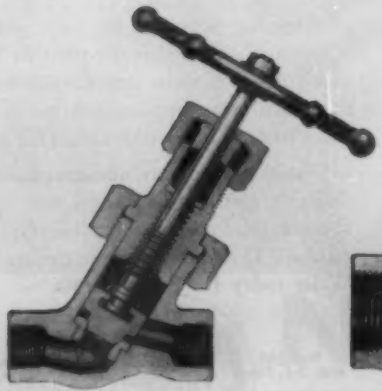
**MUDWONDER MUDLINE VALVES**
**Figs. 2128-3128**
**For pressures to 2,000-3,000 lb WOG**
**Bolted bonnets, screwed or flanged ends**

**GLOBE STOP VALVE**
**Fig. 158**
**For pressures to 10,000 lb WOG**
**Screwed bonnet, screwed or socket welding ends**

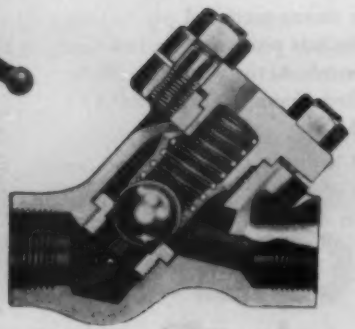


**GLOBE GAGE VALVE**
**Fig. 152**
**For pressures to 4,000 lb WOG**
**Screwed or union bonnet, screwed ends**

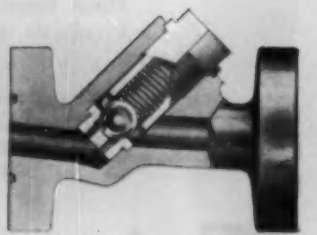




**GLOBE STOP VALVE**
**Fig. 2698**
**For pressures to 2,000 lb WOG**
**Union bonnet, screwed or socket welding ends**



**BALL CHECK VALVE**
**Fig. 4632**
**For steam pressures to 600 lb A.S.A. (2,000 lb WOG)**
**Horizontal or vertical**
**Bolted cover, screwed or socket welding ends**



**BALL CHECK VALVES**
**Figs. 5160-9160**
**For pressures to 5,000-10,000 lb WOG**
**Horizontal or vertical, screwed covers, flanged ends**

# Valves Work Everywhere
## *in drilling...production...refining...*

Edward valves are on the job, no matter where you look. From the towering derricks of Northern Alberta to offshore rigs on the Gulf . . . from refineries on the Jersey Flats to California natural gas plants . . . the word is—"You buy a better valve from Edward!"

### Edward Globe Valves

Bodies are drop-forged steel, for greater strength and resistance to erosion. Large-diameter handwheels permit operation without a wrench or cheater; cross-arm Impactor* handle for quick, tight closing is standard on 2" Fig. 158. Figures 158 and 2698 have replaceable seats. Disks—both plug and needle types—are carefully aligned, and seats are lapped for tight sealing. Stems are EValloy,* an exclusive Edward stainless steel, centerless ground to a fine finish. Carefully machined Acme stem threads assure easy operation. Bonnet threads plated by an exclusive EValizing* process for maximum resistance to wear and corrosion. Deep stuffing boxes, with exclusive EValpak* asbestos-graphite packing, assure a tight seal with minimum resistance to stem turning.

### Edward Ball Check Valves

Identical to Edward globe stop valves in body and seat features. Rolled steel bonnet with integral ribs to guide ball accurately. Ball is corrosion-resistant high carbon stainless steel, precision-ground for tight seating. High carbon stainless steel spring gives positive aid in seating ball.

### Edward Mudwonder Valves

Body and bonnet are high-strength alloy steel with heavy body-bonnet cover flanges. Accurately machined to assure drop-tight sealing under extreme pressures. Double-threaded yoke bushing, completely enclosed, gives 2-to-1 ratio. Corrosion-resistant stainless steel stem with slotted gate coupling to eliminate bending or binding. Gate is hard chrome plated to reduce friction, resist erosion and abrasion. Seat insert of resilient buna–N synthetic rubber, molded integrally over steel wear rings. Seat and gate easily replaced without removing Mudwonder* from line.

### WHERE CAN YOU USE EDWARD VALVES?

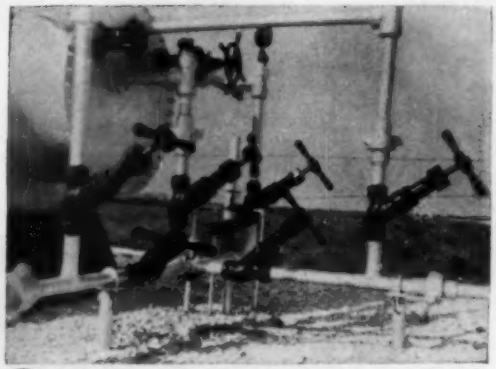
Our customers report complete satisfaction in the use of Edward valves for water flood service . . . throttling . . . on high-pressure heaters, treaters and separators . . . on pressure vessel controls . . . on headers and flow lines to heaters and exchangers . . . for manifold service . . . in gasoline or gas sulfur extraction plants . . . for "unloading" valves at gas compressor stations . . . and in many other applications. You name your need . . . let your Edward representative show how to fulfill it with versatile, economical, completely dependable Edward valves. They are available from your favorite oil field supply store, from your industrial distributor, or direct from *Edward Valves, Inc., 1200 W. 145th Street, East Chicago, Indiana* (Subsidiary of Rockwell Manufacturing Company). Represented in Canada by Lytle Engineering Specialties, Ltd., Montreal, and Rotary Sales & Service, Ltd., Edmonton.

EDWARD STEEL VALVES

another fine product by

**ROCKWELL**

Edward builds a complete line of forged and cast steel valves from ¼" to 18"; in globe and angle stop, gate, non-return, check, blow-off, stop-check, relief, hydraulic, instrument, gage and special designs; for pressures up to 10,000 lbs; with pressure-seal, bolted, union or welded bonnets; with screwed, welding or flanged ends. *T.M. Reg. U.S. Pat. Off.



Edward 2" Fig. 158 valves in service on heater by-pass lines in Louisiana oil fields. Note Impactor handles for quick, easy closing against high pressures.

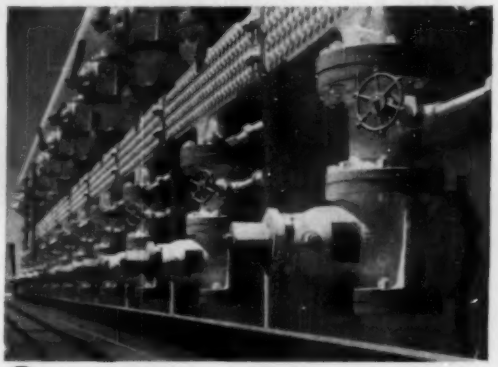
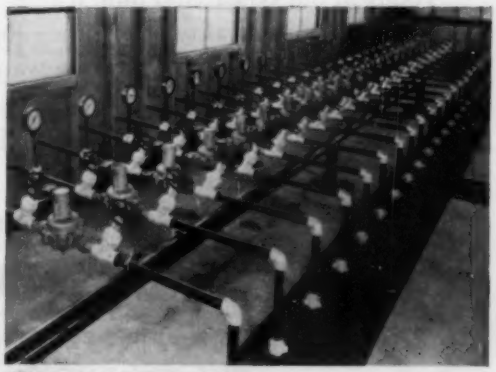


Fig. 2698 valves on cooling coils of natural gas cooler. Scene: New Mexico field processing plant. Lubricated plug valves in photo are Rockwell-Nordstrom.



Forty-two Edward forged steel globe valves (Fig. 2698) throttle the flow on this West Texas water flood. Owner reports absolutely no maintenance costs in two years (over 4,000,000 barrels of water)!

# Little Things Produce Big Results

## ...like Wheatland Steel Pipe Quality

A little thing—a finger in a dike—once accomplished so much. Today at the Wheatland mill, it's the *small* detail, done well, that produces finer quality steel pipe—formable, weldable, durable and strong—the kind of pipe *you* want for *your* installations.

*...pipe with the yearmark!*

For information about Black or Galvanized Steel Pipe, contact

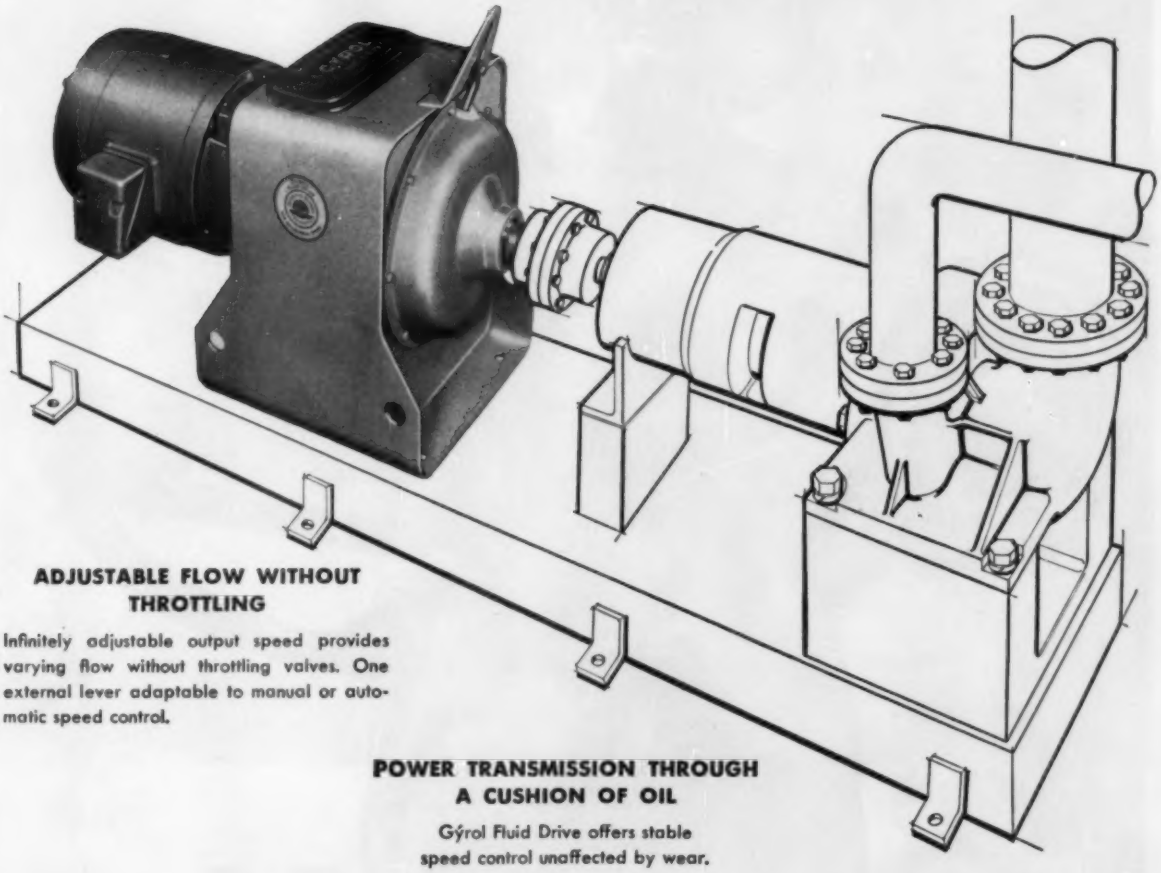
**WHEATLAND TUBE CO.**

BANKERS SECURITIES BUILDING, PHILADELPHIA 7, PA.

MILLS: WHEATLAND, PA. • DELAIR, N.J.

API LINE PIPE IN ACCORDANCE WITH AMERICAN PETROLEUM INSTITUTE SPECIFICATIONS

# American Blower *Gýrol*® Fluid Drive makes pumps more productive!



**ADJUSTABLE FLOW WITHOUT THROTTLING**

Infinitely adjustable output speed provides varying flow without throttling valves. One external lever adaptable to manual or automatic speed control.

**POWER TRANSMISSION THROUGH A CUSHION OF OIL**

Gýrol Fluid Drive offers stable speed control unaffected by wear.

Fact is, a Gýrol Fluid Drive can benefit any process requiring adjustable control of pump flow and pressure.

By providing *stepless speed control* without wasteful throttling, it reduces power consumption and pump work-load, keeps maintenance costs to a minimum. The problem of handling liquids at varying viscosity and density is greatly simplified.

With no mechanical connection between driving and driven shafts, adjustable speed is obtained without friction or wear. The smooth cushion of power-transmitting oil protects both driving and driven machines from shock. Torque-limiting capacity guards against overload.

Any standard pump driven by a constant-speed motor can be equipped with Gýrol Fluid Drive. Type VS, Class 2 Unit (shown here) comes in a complete range of sizes from 1 to 800 hp. Other designs handle up to 12,000 hp. So if you want to save power and reduce equipment and maintenance costs on pumping jobs that involve varying capacities . . . consider American Blower Gýrol Fluid Drive.

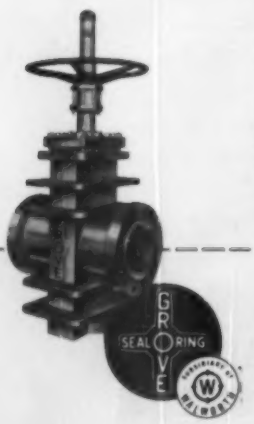
For full information, contact one of our 73 branch offices. Or write: American-Standard,* American Blower Division, Detroit 32, Michigan. In Canada: Canadian Sirocco products, Windsor, Ontario.

*American-Standard and Standard● are trademarks of American Radiator & Standard Sanitary Corporation.

AMERICAN-Standard

AMERICAN BLOWER DIVISION

# You're never stuck with a GROVE VALVE



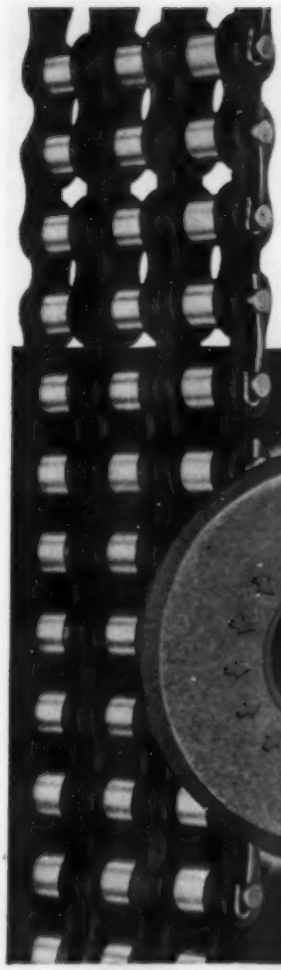

Here's the valve you set and forget. Grove's exclusive Seal-O-Rings wipe out the need for valve lubrication. You're never stuck with valve failure because of forgotten lubricant or depleted sealing compound. The load of lubrication is gone forever. Specify Grove Seal-O-Ring Gate Valves. Under pressure the tightest seal in the line.

Grove valves never require lubrication

**GROVE VALVE & REGULATOR COMPANY**

**6529 Hollis Street, OAKLAND 8, California**

HOUSTON 23—3517 Polk Avenue • LOS ANGELES 6—2559 W. Olympic Blvd.
ODESSA • TULSA • DENVER • CHICAGO • NEW YORK
FARMINGTON, N. M. • LAFAYETTE, LA. • HARVEY, LA. • In Western Canada: GROVE VALVE LTD. EDMONTON

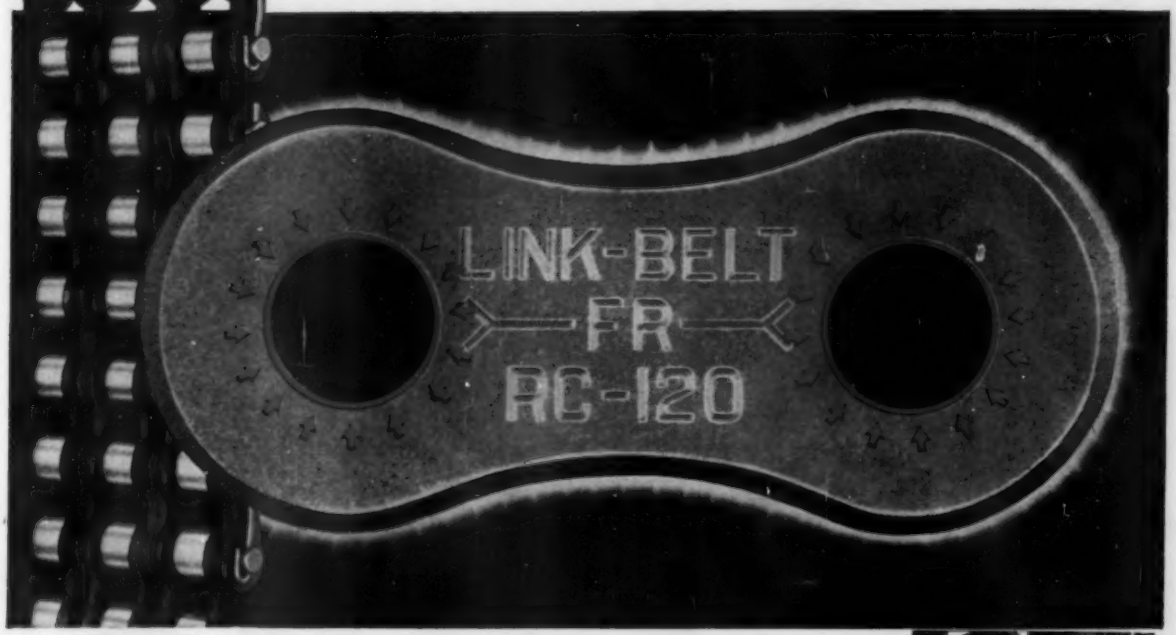


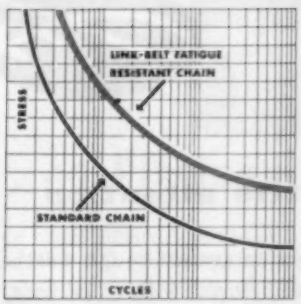
# LINK-BELT FR roller chain

FATIGUE RESISTANT

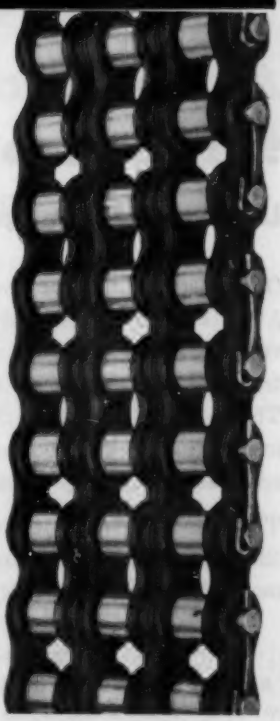
® U.S. Patent No. 2,517,497

## . . . fortified against fatigue




*Special sidebar processing lifts chain endurance limit . . . develops greater dynamic strength*



The brutal stresses encountered on today's drawworks are too great for ordinary roller chain to long withstand. For this reason, Link-Belt adds FR—special sidebar processing that promotes longer chain life as shown on the above chart. By compressing the metal around pitch holes, Link-Belt fortifies critical sidebar areas against fatigue . . . thus creating extraordinary *dynamic strength.*

Any leading supply store in the field can give you full details and a copy of Link-Belt catalog 2880. You'll also find full information on these Link-Belt roller chain "extras":

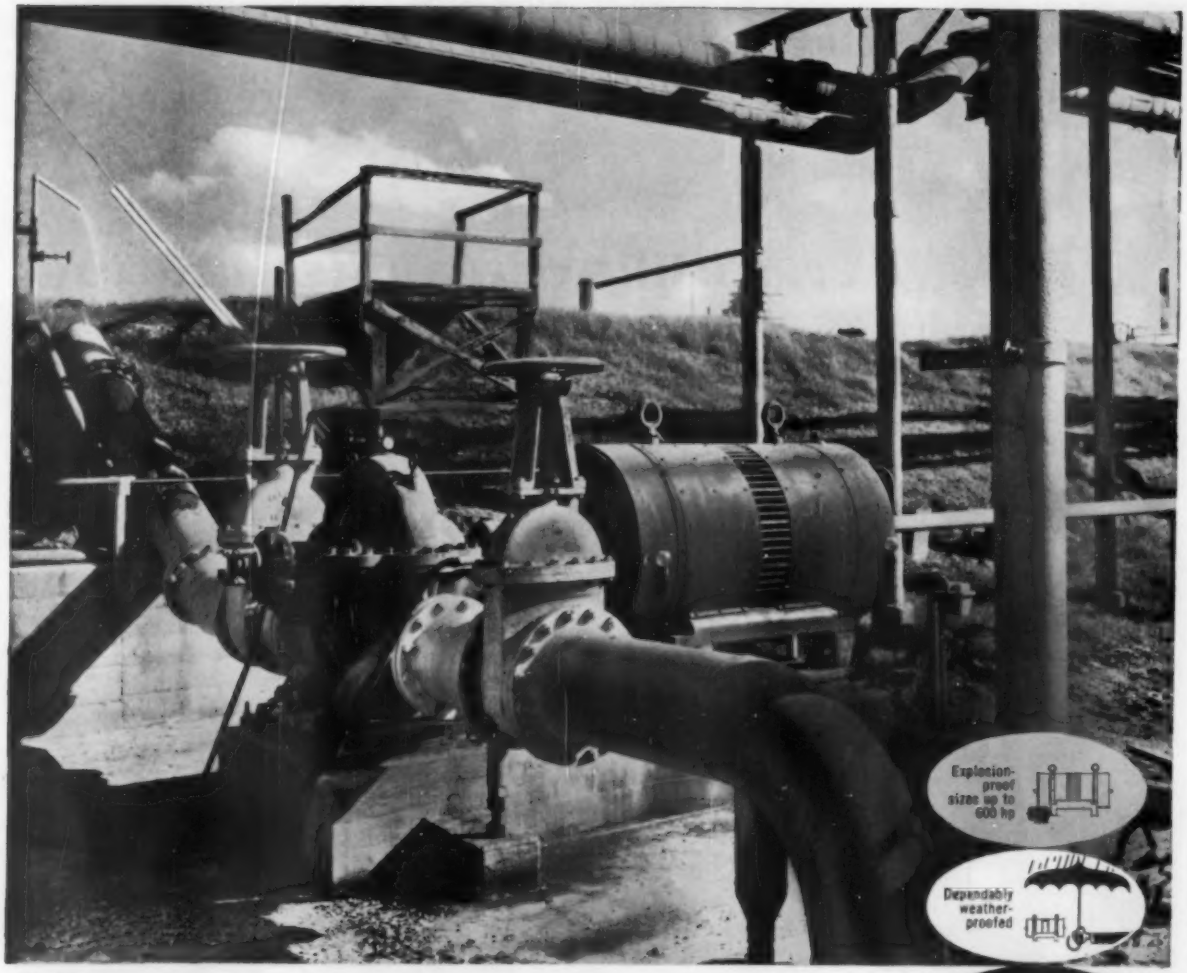
- SHOT-PEENED ROLLERS
- PRE-STRESSING
- E-Z ASSEMBLY
- SHEPHERD'S CROOK COTTERS
- CLOSER HEAT-TREAT CONTROL
- DOUBLE BOXING

**LINK-BELT**

**ROLLER CHAINS & SPROCKETS**

14,081

LINK-BELT COMPANY: Indianapolis 6, Houston 1, Dallas 26, Odessa, Tex., New Orleans 16, Shreveport, La., Los Angeles 22 (Montebello), Scarboro (Toronto 13); Export Office, New York 7. Distributors in All Fields.




# A dependable guard for petroleum outposts

## Louis Allis explosion-proof motors need little attention

Once installed in your unattended locations, Louis Allis fan-cooled, explosion-proof motors can be virtually forgotten. They're designed to assure long, trouble-free service with a minimum of attention. That's why you'll find them in countless remote installations, like the above 450 hp pump-motor application at a large refinery in the Southwest.

These dependable motors incorporate insulation that resists heat, moisture, and corrosion. What's more, the sturdy completely-enclosed cast-iron housing is perfect protection against rough weather — shrugs off rain or sandstorms with equal ease, and ignores even the corrosive effect of saltwater spray.

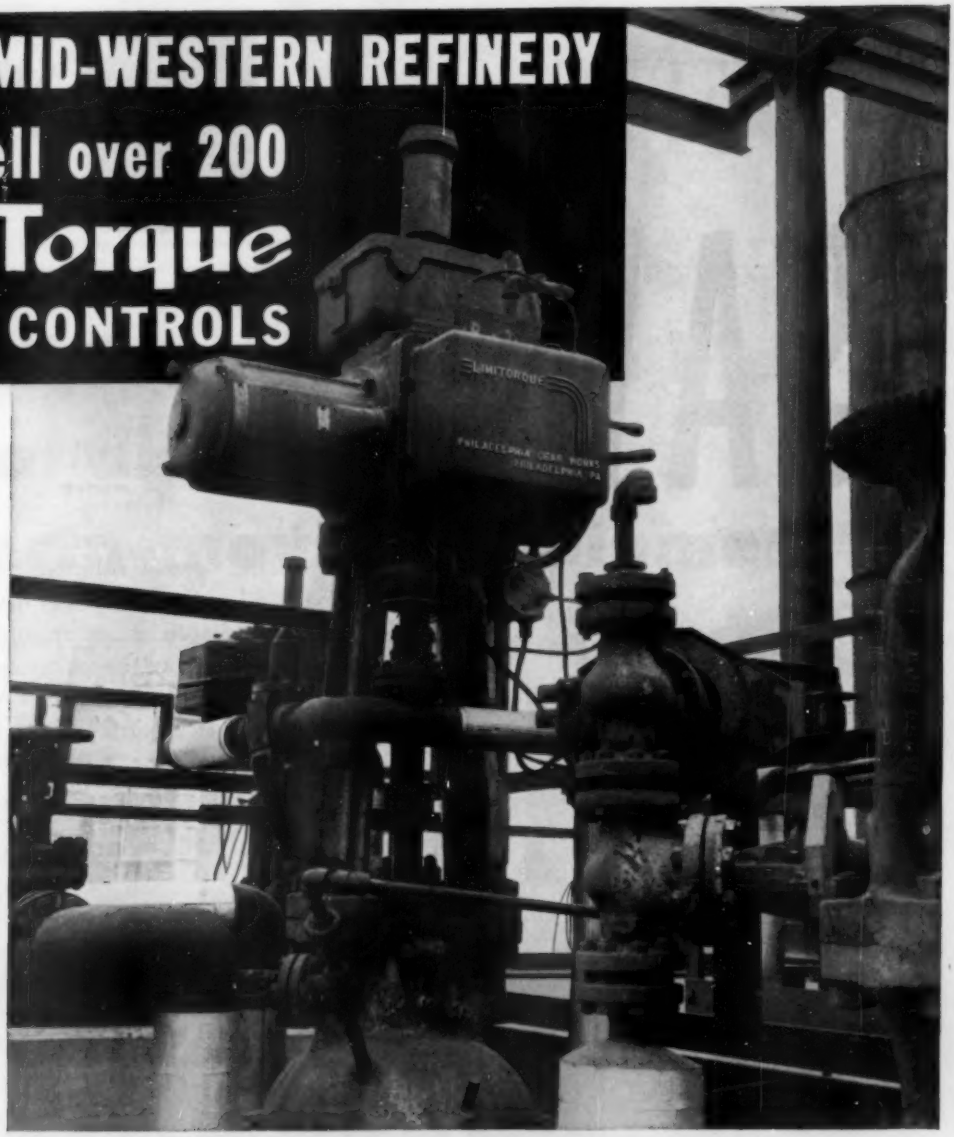
Generous bearing sizes and ample provision for lubrication assure minimum maintenance attention and long, trouble-free bearing life.

You will like these motors for remote installations. Ask your Louis Allis District Office for Bulletin 800 — or for engineering assistance. Or write The Louis Allis Co., 449 E. Stewart Street, Milwaukee 1, Wis.

**LOUIS ALLIS**

MANUFACTURER OF ELECTRIC MOTORS AND ADJUSTABLE SPEED DRIVES

# LARGE MID-WESTERN REFINERY uses well over 200 LimiTorque VALVE CONTROLS




## . . . on Platinum Catalyst Reforming Units

The above illustration shows a LimiTorque Motorized Valve Control mounted on a 12", 600 lb. valve on a platinum catalyst reforming unit . . . This is just one installation of well over 200 such units used in this modern, well known refinery, and is but one of many thousands of LimiTorque controls used throughout the refinery field in America and foreign countries.

These LimiTorque units are of explosion-proof design having motors with Underwriters Labels . . . They are also equipped with position indicators which transmit valve position back to the control point.

There is no guesswork or labor connected with the LimiTorque Valve Controls . . . from a conveniently located control point, one key man can open and close any type of valve quickly and dependably in remote or hazardous locations.

LimiTorque may be actuated by any available power source, such as Electricity, Oil, Gas, Water or Air; and is available for Microwave control.

*Send for Catalog L-550 for details.*

*THERE IS NO SUBSTITUTE FOR* —

**LimiTorque®**

**PHILADELPHIA GEAR CORPORATION**

ERIE AVE. & G STREET, PHILADELPHIA 34, PENNA.

Offices in all Principal Cities

**INDUSTRIAL GEARS & SPEED REDUCERS • LIMITORQUE VALVE CONTROLS • FLUID AGITATORS • FLEXIBLE COUPLINGS**

Limitorque Corporation • Philadelphia

SAVE
maintenance

SAVE
manpower

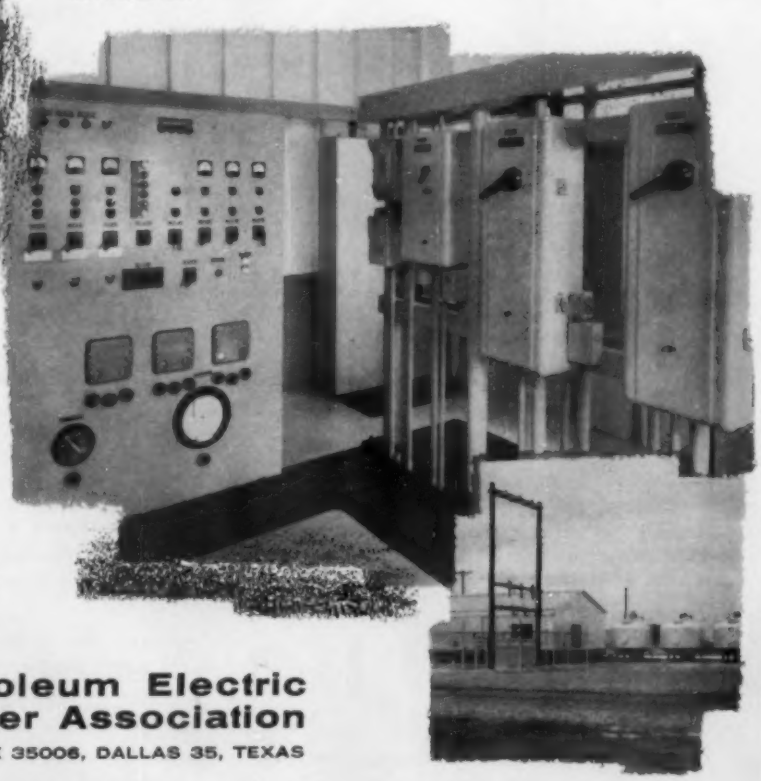
# SAVE with Electric Operation

SAVE
money

This automatic electric control equipment designed and installed by a major oil company provides the greater flexibility of operation and dependability required for utmost economy in water flooding as well as remote control for field pumping. View at bottom shows 500 KVA transformer station supplying Purchased Electric Power to the pumping plant.

For information on savings Electric Power offers your operation, call your nearest Utility Electric Service Company or write us.

*Three 100 HP, 440 V motors driving pumps supplying imput water*



*Purchased Electric Power . . . saves money, manpower, maintenance and serves you better automatically*

**Petroleum Electric Power Association**

P.O. BOX 35006, DALLAS 35, TEXAS

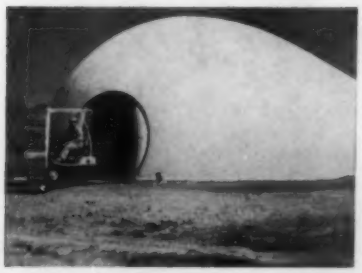
DU PONT *Petroleum Chemicals* NEWS

Number 91 in a Series of Bulletins for the Petroleum Industry

SEPTEMBER 1958

# Additives double the life of diesel fuel filters in earth-moving equipment

## Air-supported nylon warehouses solve storage problems for oil marketers



Low cost and easy portability are the chief advantages of air-supported warehouses like the one pictured here.

Such structures provide ideal storage shelter for petroleum products in drums, and TBA items. The cost can be as little as one-tenth that of the same-sized structure built of conventional materials. When deflated, the entire building can be transported in a station wagon. Only a couple of hours are required to erect the air-supported structure of average size. And the entire job can be done by two men.

### Made from oil

Another important feature of the air-supported warehouse which is of particular interest to oil men is that it is made of petroleum-based nylon.

Nylon is a typical example of the many new products which the chemical industry is developing from petroleum. And the Du Pont Company is one of the leaders in the development of oil-based chemical products.

## CUT DOWNTIME IN HALF

Five recent months of field and laboratory tests put new light on filter performance in automotive diesel equipment.

The first field testing phase determined the "hours to plugging" of secondary filters in earth-movers operating on fuel which had *not* been treated with Du Pont additives. These were the commonly used resin-impregnated paper filters with a porosity of approximately two microns . . . filters known to afford excellent protection for fuel-injection units.

**FILTERS WERE CONTINUALLY CHECKED** throughout the test. Paul Richard, Du Pont representative and automotive specialist, is shown at left discussing filter-plugging problems with one of the diesel operators.

In the second phase, Du Pont Fuel Oil Additive No. 2 (FOA-2) and Du Pont Metal Deactivator (DMD) were added to the test fuel. *Filter life*, on the average, *was doubled*.

This means, of course, that only half as many filters were required, and that costly downtime for emergency servicing in the field, and filter replacement, was cut in half.

### Insoluble residue reduced

FOA-2/DMD combinations reduce the amount of insoluble residue which nor-

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

OVER

# DUPONT *Petroleum Chemicals* NEWS

## NEW MID-CONTINENT REGIONAL MANAGER

WILLIAM W. WINGATE has been promoted to manager of the DuPont Petroleum Chemicals Division's Mid-Continent region, with headquarters in Tulsa, Oklahoma.

He was formerly assistant manager of this region. Previously Bill had been active in regional sales and technical service work on all DuPont additives other than tetraethyl lead. This includes DuPont Metal Deactivator, lube and fuel oil additives, antioxidants, dyes and grease stabilizers.

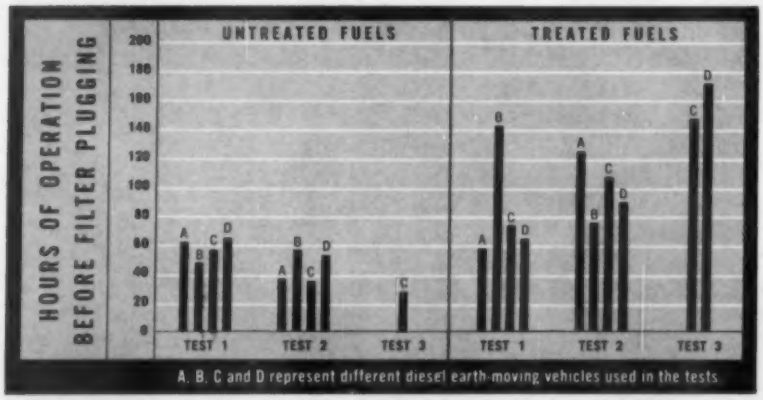
Bill Wingate had an early introduction to the oil industry doing gasoline and lube oil testing for a major oil company while earning his B.S. degree in chemical engineering at the University of Pennsylvania.

During World War II, Wingate was a lieutenant in the Navy and spent three years on submarine duty with the Pacific Fleet.

He is a member of Sigma Xi and Tau Beta Pi.

WILLIAM W. WINGATE

CONTINUED *Additives double filter life*




A, B, C and D represent different diesel earth-moving vehicles used in the tests

mally forms in a fuel during storage or recirculation in an engine fuel system. FOA-2 acts also as a solubilizer and dispersant of sludge formations, and will prevent injector sticking and filter fouling. DMD retards the formation of copper mercaptide gel as well as combatting the adverse catalytic effect of copper-bearing metals in a system.

### More flexible processing

By using FOA-2, you can balance stocks to meet varying market demands, because it stabilizes fuel during storage. You can stabilize cat-cracked distillates or blends with straight-run stocks. And you can improve residuals, too.

### Test your own stocks

It's easy to test FOA-2 and DMD in your own stocks.

Samples and technical information are available from your DuPont Petroleum Chemicals Division technical representative. Contact him for further details.

## Petroleum Lab being expanded

A large construction project, expansion of the product development and technical service facilities at the DuPont Petroleum Laboratory, is now under way. Completion is planned for mid-'59.

The project includes the addition of two new wings to the main laboratory building, to house new chemical and engineering apparatus for development and performance testing of chemical additives for petroleum products.

New facilities for the Petroleum Chemicals Division's Road Test Laboratory also are a part of the project.

## New aluminum engine to test additive performance

Looking toward future trends in the automotive industry, the DuPont Petroleum Laboratory has installed an all-aluminum test engine to check performance of fuels and lubricants in lightweight power plants.

The new unit, a four-cylinder engine duplicating a companion test engine of conventional cast iron and steel, will provide comparative performance and combustion data for the petroleum and automotive industries. It will also assist in the laboratory's development of new products to meet lightweight engine requirements. The engine will be of particular value in analyzing the performance of refinery stocks that might be used in blending future fuels.


SALES OFFICES

**Chicago 3**—8 So. Michigan Ave. . . . RAndolph 6-8630
**Cleveland 15**—25 Prospect Ave. . . . SUperior 1-1363
**Houston 2**—705 Bank of Commerce Bldg. . . . . CApitol 5-1151
**Los Angeles 17**—612 So. Flower St. . MAdison 4-1354
**New York 20**—45 Rockefeller Plaza . . . . . COlumbus 5-2342
**Philadelphia 2**—3 Penn Center Plaza . LOcust 8-3531
**Pittsburgh 22**—1 Gateway Center . . . ATlantic 1-2933
**San Francisco 4**—111 Sutter St. . . . . EXbrook 2-1934
**Seattle 3**—4003 Aurora Ave. . . . . MElrose 2-6977
**Tulsa 1**—1811 So. Baltimore Ave. . . . . LUther 5-5578
**In Canada**—DuPont Company of Canada (1956) Limited, Petroleum Chemicals, 85 Eglinton Ave. East, Toronto 12—Ontario . . . . . HUdson 1-6461
**In Other Countries**—Organic Chemicals Department, Export Division, 7447 Nemours Bldg., Wilmington 98, Del., PRospect 4-2962.


DU PONT
REG. U. S. PAT. OFF.

**Better Things for Better Living**
***. . . through Chemistry***

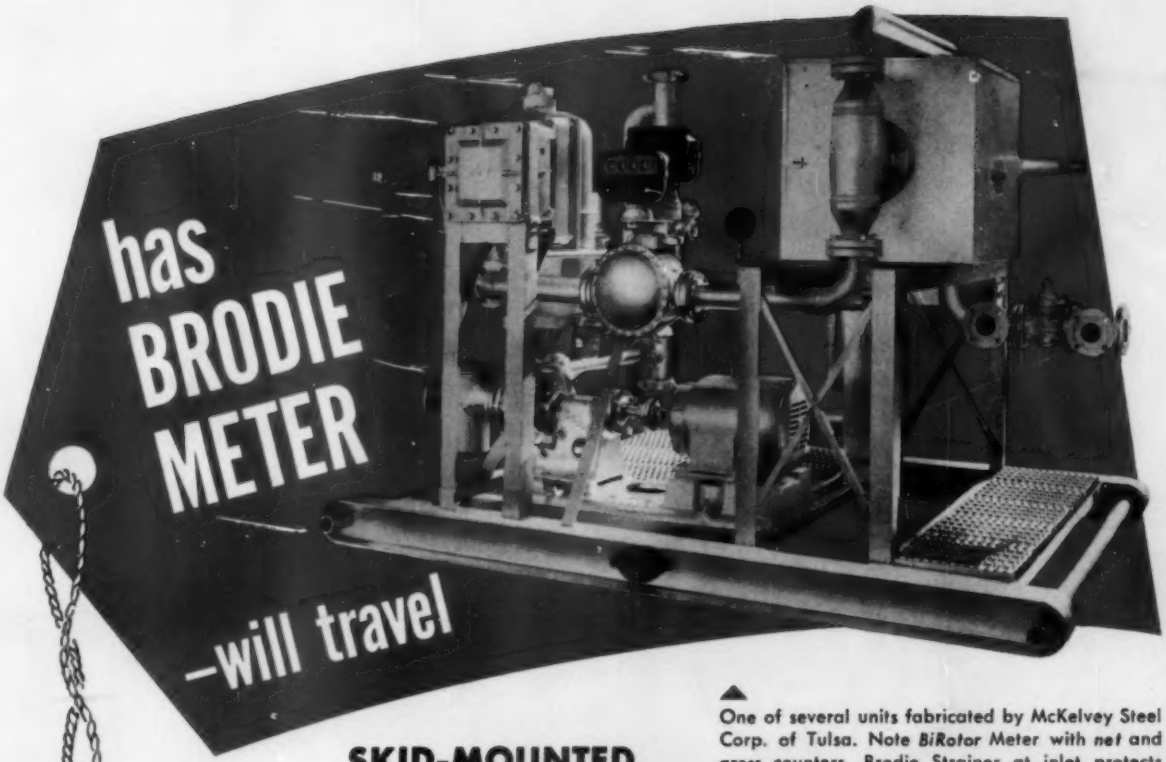
## Du Pont Tetraethyl Lead and other Petroleum Additives

OVER

*ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)*

A-7720

Printed in U. S. A.



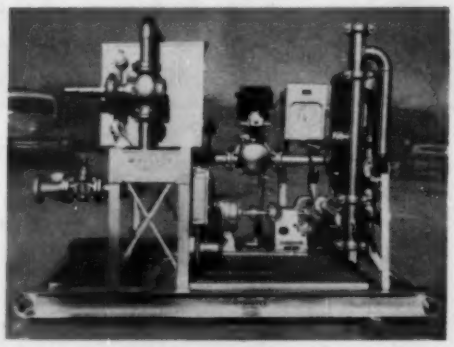

One of several units fabricated by McKelvey Steel Corp. of Tulsa. Note *BiRotor* Meter with *net* and *gross* counters. Brodie Strainer at inlet protects entire system.

## SKID-MOUNTED L.A.C.T. UNIT

At the heart of this compact, complete lease automatic custody transfer unit is the *sustained accuracy* of a Brodie *BiRotor* Meter. Readout and printer show *net* barrels which crude would measure at 60 F. Corrections for both line and ambient temperature are made by the Brodie *Automatic Temperature Compensator* with *Full Range Gravity Selector*, adjustable to precise expansion coefficient of any crude. Dual counter also shows *gross* barrels to simplify proving.

Brodie measuring units have just two fluted rotors in vibration-free balance, without sliding vanes or reciprocating parts. Double case construction isolates measuring unit from piping strain. These are important factors in the *sustained accuracy* and trouble-free performance required for custody transfer.

*In planning your positive displacement L.A.C.T. metering systems, you'll find the experience of Brodie Metering Specialists* as near as your phone.



In addition to Brodie PD Meter, unit has air eliminator, motor and pump, automatic sampler, BS&W monitor, back pressure regulator, outlet valve and flanges — ready for direct connection between lease and line.

804

# BRODIE BiRotor METERS

ALL-STEEL TRUE ROTARY

**RALPH N. BRODIE COMPANY · San Leandro, California, U.S.A.**

MT. VERNON, N. Y. 550 So. Columbus Ave. · DALLAS 7, TEXAS 167 Parkhouse St. · CHICAGO OFFICE: 1227 Circle Ave., Forest Park, Ill. · SEATTLE 9, WASH. 221 9th Ave. N. · LOS ANGELES 22, CALIF. 5401 Sheila Street

REPRESENTATIVES WITH STOCKS AND SERVICE FACILITIES IN ALL PRINCIPAL CITIES

# New Partners in Progress

**ARTHUR G. McKEE & COMPANY**

**AND RAYMOND INTERNATIONAL INC.**

**JOIN IN AN OVERSEAS WORKING AGREEMENT**

Now the combined skills, resources and extensive experience of these two internationally renowned organizations are linked in a progressive world-wide working association. These skills can be applied to your overseas petroleum refinery or chemical plant projects on a *single contract* basis!

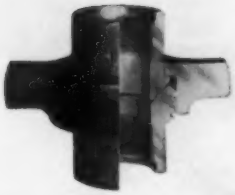
The McKee-Raymond working team assures the utmost in efficient, comprehensive services and offers the ability to handle the entire job ... preliminary studies, design, engineering, purchasing and construction.

So if you're planning a petroleum or chemical project in Asia, Africa, Australia, New Zealand or South America, investigate the advantages of using McKee-Raymond. Write either Raymond International Inc., 140 Cedar St., New York 6, N.Y. or Arthur G. McKee & Co., 2300 Chester Ave., Cleveland, Ohio.

**McKEE·RAYMOND**

**OVERSEAS ENGINEERING AND CONSTRUCTION SERVICES**

# And he said,



## "BE SURE THEY ARE WECO UNIONS!"

"You know the Boss standardized with WECO Unions on his rigs a long time ago. He says it saves money and I know it saves a lot of time. You'd be surprised how fast we get a bit into the ground since we don't waste time trying to match unions during rig-up. Yesterday we were able to jerk out number one pump and replace it with a standby without losing time because both had the same WECO Unions.

"WECO Unions always make-up right, too . . . that ball and cone seat seals perfectly and the nuts are strong enough to take rough treatment.

"Another thing I like is, we can get WECO Unions at Supply Stores anywhere. We don't have to carry around a bunch of spares."

U-9-58

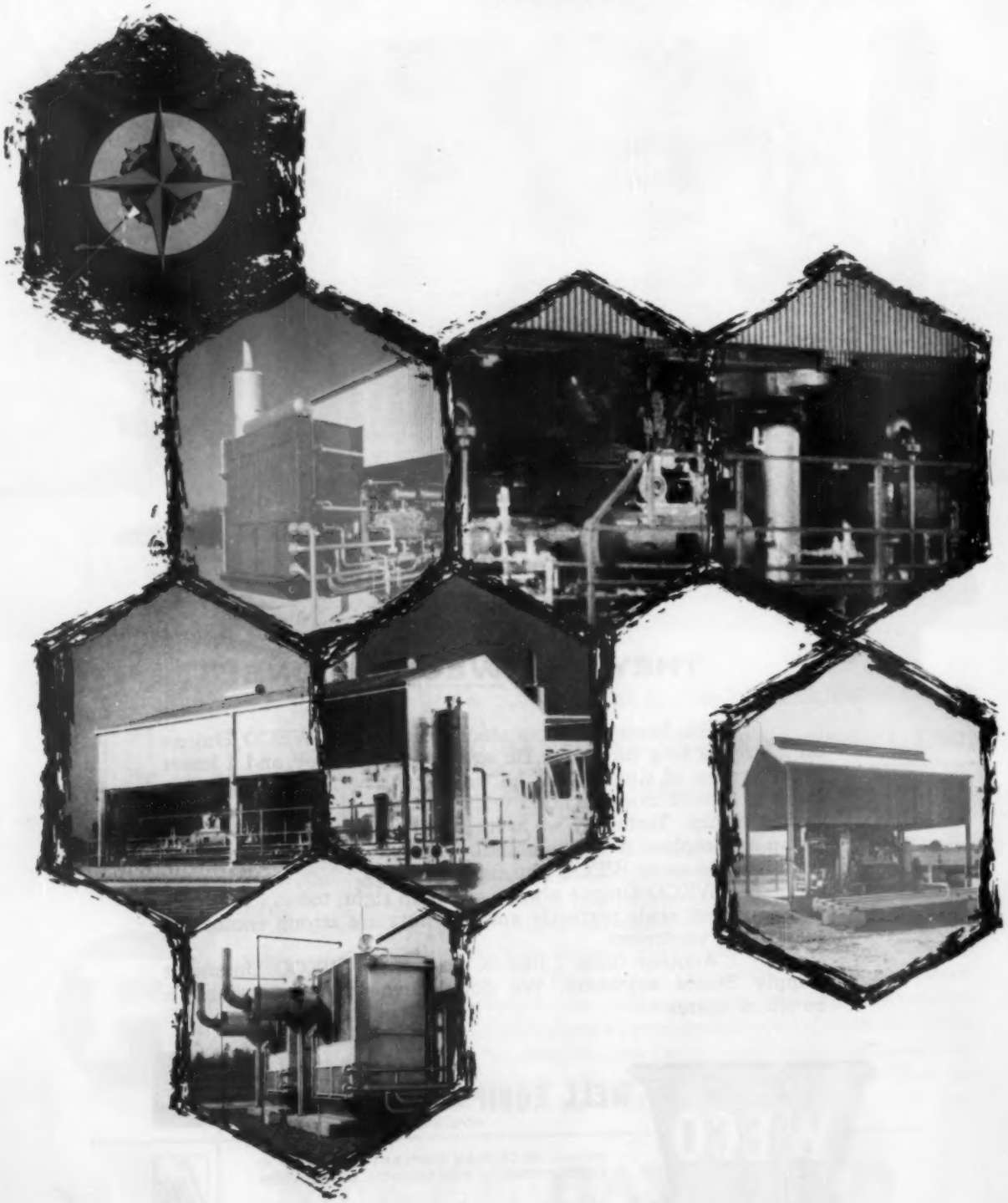
WECO®

**WELL EQUIPMENT MFG. CORP.**
HOUSTON, TEXAS

Division of CHIKSAN COMPANY *a subsidiary of* FOOD MACHINERY AND CHEMICAL CORPORATION

fmc

# Southwest Designs, Engineers, Plants Using the



# and Builds Packaged Compressor
# Compressor You Select

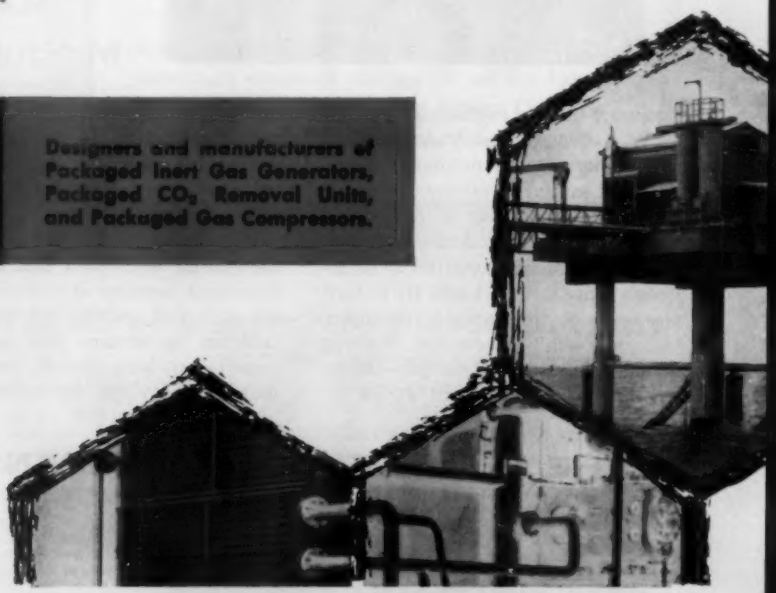
Now to the advantages of Southwest design and engineering you can add flexibility of choice by selecting your own make and type compressor in sizes of 100 to 880 hp. You have the sound advantages of proved Southwest engineering. There is no increase in your parts inventory. There is no training period to familiarize your personnel with a new make compressor. Yet, you can have the vastly improved and superior Southwest design for your packaged gas compressor.

Southwest Packaged Gas Compressor Plants installed in the field are now producing more than 100,000 horsepower—compressing more than 1½ billion CF/D—for field pressure boosting, main line gas pipe line pumping, secondary recovery, and other difficult applications.

**SOUTHWEST INDUSTRIES, INC.**

P. O. Box 19392, Houston 24, Texas

**Designers and manufacturers of Packaged Inert Gas Generators, Packaged $CO_2$ Removal Units, and Packaged Gas Compressors.**



# Capacity Tripled

## with only 30 days' downtime!

### Kellogg Alkylation Unit Minimizes Gulf Revamp Costs

Economy-minded engineering by The M. W. Kellogg Company enabled Gulf Oil Corporation to minimize downtime and capital investment when increasing the capacity of Alkylation Unit No. 1 at its Port Arthur refinery.

Now producing 5,000 BPD of alkylate, this former 1,500 BPD unit was expanded primarily by installing two modern, five-section Kellogg Model B Cascade Reactors—shown at left. Other equipment added included pumps, exchangers, vessels, and instruments. By utilizing four original towers and much of the original equipment, costs were reduced considerably.

Despite the problem of integrating the existing equipment with the new, downtime between shutdown of the old unit and putting the expanded facilities on stream was only one month—an insignificant loss compared with savings in investment.

In this case, Gulf's own maintenance crew hooked up the new unit to the existing towers. Kellogg operators assisted in bringing the job on stream.

Kellogg welcomes the opportunity to work on your expansion or revamp projects. For prompt attention, write Kellogg's Contract Sales Division.

**THE M. W. KELLOGG COMPANY**

711 Third Avenue, New York 17, N. Y.

A SUBSIDIARY OF PULLMAN INCORPORATED

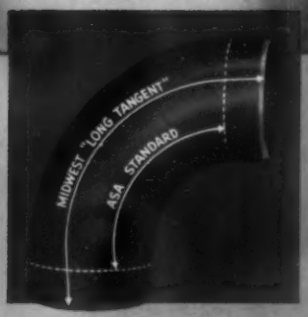
*The Canadian Kellogg Company Ltd., Toronto • Kellogg International Corp., London • Kellogg Pan American Corp., New York*
*Societe Kellogg, Paris • Companhia Kellogg Brasileira, Rio de Janeiro • Compania Kellogg de Venezuela, Caracas*

# A familiar sight around gas pumping stations

One of six new semi-automatic gathering stations of the Northern Natural Gas Company that have Midwest "Long Tangent" Elbows ... and other Midwest Welding Fittings.

## MIDWEST "LONG TANGENT" ELBOWS

Midwest "Long Tangent" Welding Elbows are "a natural"... their many benefits for the user are today so generally recognized that you see them wherever you go. For all the facts, ask your Midwest Welding Fittings Distributor (or write us) for a copy of Catalog 54.




## ADVANTAGES OF MIDWEST "LONG TANGENT" ELBOWS

- They save pipe.
- They often eliminate short nipples and their extra welds.
- They save time and money in lining up and clamping pipe and fitting.
- They make it easier to apply slip-on flanges.
- They remove the circumferential weld from point of maximum stress and can be sleeved.
- THEY COST NO MORE THAN OTHER ELBOWS.

**MIDWEST PIPING COMPANY, INC.**
Main Office:
St. Louis 3, Missouri (P.O. Box 433)
Plants:
St. Louis, Clifton, N. J. and Los Angeles

SALES OFFICES: ASHEVILLE (Box 446, SKYLAND, N. C.)
BOSTON 27—426 First St. • CHICAGO 3—79 West Monroe St.
CLEVELAND 14—616 St. Clair Ave.
HOUSTON 2—1213 Capital Ave.
LOS ANGELES 33—520 Anderson St. • MIAMI 34—2103 Le Jeune Rd.
NEW YORK 7—50 Church St. • ATLANTA 9—72 11th St., N. E.
PITTSBURGH 19, PA.—437 Grant St. • ST. LOUIS 4—1490 S. Second St.
SAN FRANCISCO 11—420 Market St. • TULSA—1640 E. 21st St.
STOCKING DISTRIBUTORS IN PRINCIPAL CITIES

MIDWEST WELDING FITTINGS IMPROVE PIPING DESIGN AND REDUCE COSTS

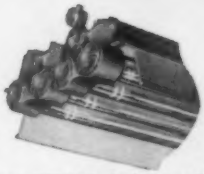
# For Modern, Hazardous Area Lighting...

Type "EFU" Explosion-Proof 3-Lamp Fluorescent Lighting Fixture

*choose*

# APPLETON®

## "EFU" Explosion-Proof Fluorescent Fixtures



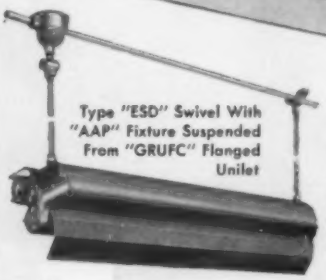
Type "EFU" Explosion-Proof 4-Lamp Fluorescent Lighting Fixture

Type "EFU" Explosion-Proof 2-Lamp Fixture For Horizontal or Angle Mount

Patent No. 2,392,202 and Pat. Pending

### CHECK THESE FEATURES

- Factory sealed for easy, trouble-free installation
- Available in: Pre-Heat Bi-Pin; Rapid Start Bi-Pin; Instant Start Single Pin Slimline
- Less than 12" required between canopy unilet and fixture
- 45° or horizontal mounting
- "Rapid Start" ballasts where desired for longer lamp life, no flicker, quiet operation, no starters and long ballast life
- Steel reflectors, white enameled inside . . . grey outside



Type "ESD" Swivel With "AAP" Fixture Suspended From "GRUFC" Flanged Unilet

*Introduces flexibility in suspension of single unit lighting fixtures in hazardous locations. Meets National Electric Code Article 500.*

■ Yes, APPLETON "EFU" Fixtures are factory sealed and so perfectly designed and superbly built they eliminate the need for external seals normally required within 18 inches of arcing devices as specified in Article 500 of the National Electric Code. Available in 2, 3, or 4 lamp models for straight or angle mounting, with "Pre-Heat," "Slimline" or "Rapid Start" ballasts. All models have cast aluminum end housings with line connectors to terminal block. Fixtures may be installed as a single unit or in a continuous row. Re-lamp from either end. Swivel unions are available for fixture flexibility that allows quick re-lamping in tight places. Write for wattages, types of fixtures or complete specifications.

APPLETON® Lighting Fixtures are available in non-fluorescent and fluorescent as well as a wide variety of non-explosion-proof and explosion-proof styles. Special shelf, bin and high bay illumination numbers. Write to us stating problem.

*Sold Through Franchised Distributors Only*

APPLETON ELECTRIC PRODUCTS®

**APPLETON ELECTRIC COMPANY**
1701 Wellington Avenue · Chicago 13, Illinois

Also Manufacturers of:

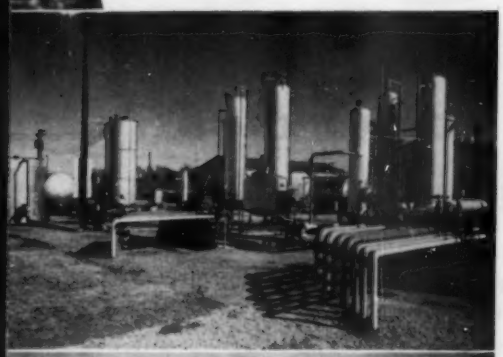
Malleable Iron Unilet Fittings

"ST" Series Connectors

"Eagle Claw" Switch Boxes

Reelites

# BS&B Research & Development Facilities... An Investment In Your Future And Ours!



Out of these BS&B facilities for product research and development ... and out of the minds of the men who labor here ... have come notable technological advancements in natural gas and crude oil production, processing, measurement and storage.

These facilities, staffed by highly experienced, full time development engineers, provide for full-scale testing of equipment under actual lease conditions. The laboratory has an oil, water and gas circuit which allows testing of low pressure equipment at oil flow rates up to 3,500 barrels per day, and a high pressure gas circuit, capable of flowing 10 million standard cubic feet of natural gas per day.

Examples of new equipment developed and tested here include BS&B's Lease Automation Systems, Liquid Metering Equipment and Ammonia Absorption Refrigeration Units. These contributions to a better future for the oil and gas industries were made possible by *you*, our customers, because a part of every dollar invested in the purchase of BS&B oilfield equipment goes into a continuation of this research and development program.

From it you will receive many future "dividends" in the form of new equipment developments, improved technology and additional savings through increased operating economy. Make it a habit *always* to call your BS&B man *first!*

"BS&B research shows the way"

**BLACK, SIVALLS & BRYSON, INC.**
Oilfield Equipment Division, Dept. 1-A9A
P.O. Box 1714 Oklahoma City, Okla.

The **NEW**

# *Sherman* PANTHER POWER DIGGER

## with Quick Detach and Many Exclusive Features

The introduction of the new Sherman Panther Power Digger obsoletes all other tractor mounted backhoes. Before you buy any power digger, compare it feature for feature with these Sherman advantages: • For all Ford Gas and Diesel Tractors • Rear mounted hydraulic system to eliminate long, power-robbing lines • Special transmission to step up power take-off shaft speed to permit use of small pump delivering 2000 P.S.I. • 25 horsepower hydraulic system • 2-way chevron packings with phenolic top and bottom rings to act as bearings and prevent metal to metal contact between cylinder walls and pistons • Flow control valve to eliminate all chain slack and assure positive control in every digging position • Stress-design box construction boom • Quick detach in a matter of minutes • Reinforced stress-design box dipstick • 19,250 lbs. digging force available • Shock absorbing subframe • Individually controlled stabilizers • 188° uninterrupted arc of swing • and many other features. Write today for Bulletin No. 1586.

***Sold and Serviced by your nearby Ford Tractor Dealer***

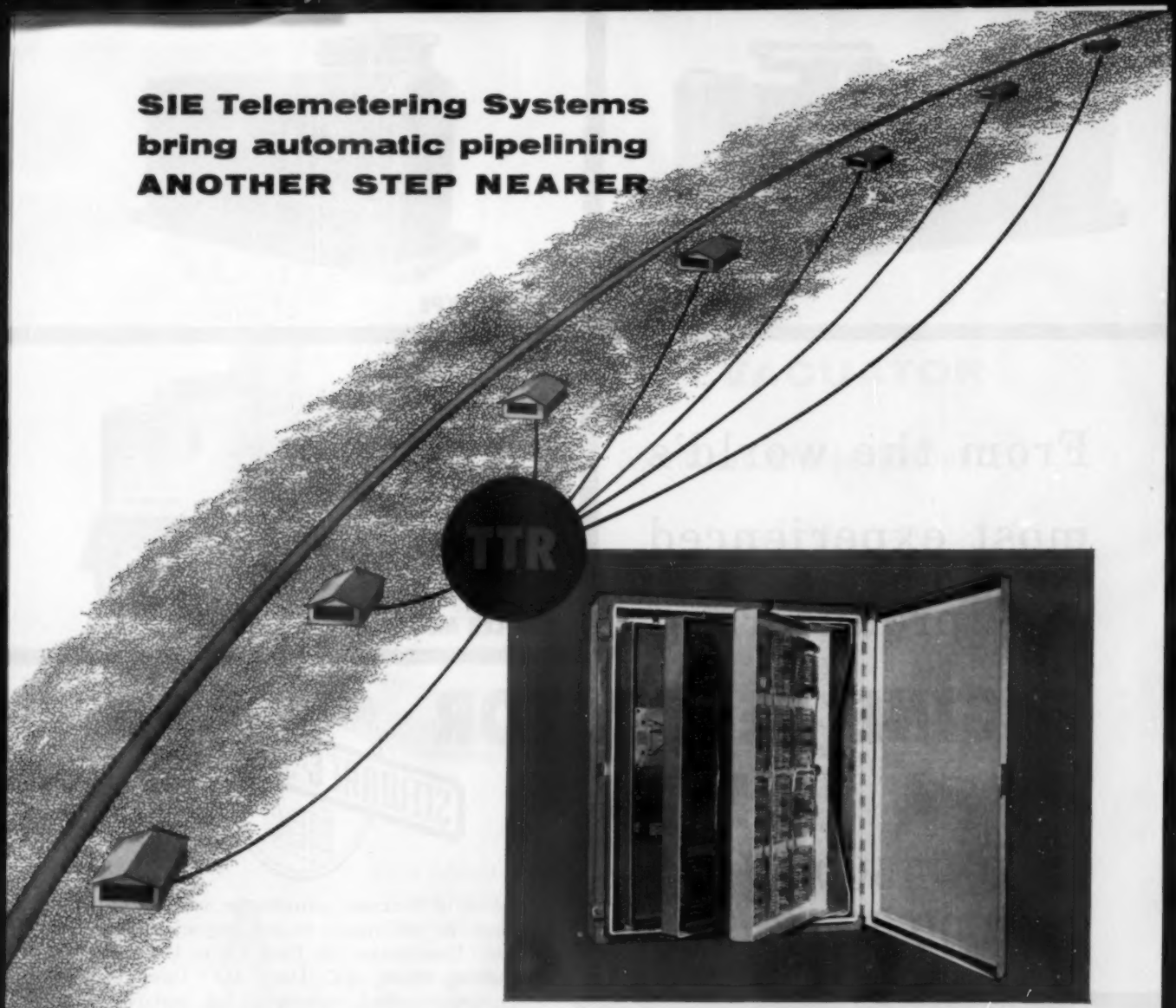
POWER DIGGERS
•
LOADERS
•
FORK LIFTS

Sherman S Products

SHERMAN PRODUCTS, INC., Royal Oak, Michigan

SOIL WORKING TOOLS
•
CRANES
•
EXCAVATORS

# SIE Telemetering Systems bring automatic pipelining ANOTHER STEP NEARER




With the development of the TTR Telemetering System, SIE moves another major step forward toward the fully automatic pipe line.

TTR Telemetering Transceivers are the newest addition to the SIEMARC (SIE Monitoring and Remote Control) system. By receiving measurement data and trouble signals from remote units and returning necessary command signals, the TTR provides the vital automatic link between compressor stations and the dispatching office.

An unlimited number of functions may be carried on a single voice frequency channel. Unique modulation methods and coding techniques minimize random errors and make possible the use of low cost, readily available transmission facilities. Solid state circuitry and straightforward design assure system reliability and long service life.

Combined with SIE Compressor Start Units, Telemetering Transceivers allow immediate interrogation of remote functions and automatic verification of performance, and provide the dispatcher with continuous centralized monitoring and control.

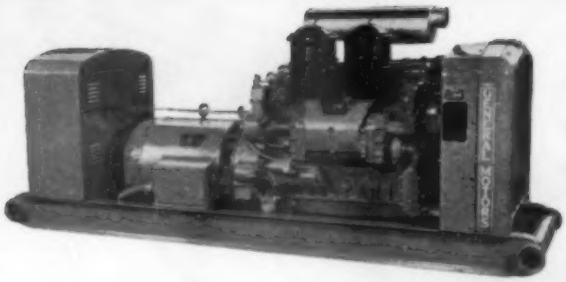
If you are contemplating new pipe line construction or modernization of existing lines, *plan ahead toward the fully automatic pipe line* by installing these basic units now. Contact the SIE Control Division for full information.

SIE

**SOUTHWESTERN INDUSTRIAL ELECTRONICS COMPANY**

**2831 Post Oak Road • P. O. Box 13058 • Houston 19, Texas**

PRIME AND SUB-CONTRACTORS FOR MILITARY ELECTRONIC INSTRUMENTATION AND GROUND SUPPORT EQUIPMENT



OPEN TYPE

CLOSED TYPE

TRAILER MOUNTED

From the world's most experienced producers of

# ENGINE GENERATOR SETS

1500 Watts to 1000 Kilowatts

STEWART & STEVENSON

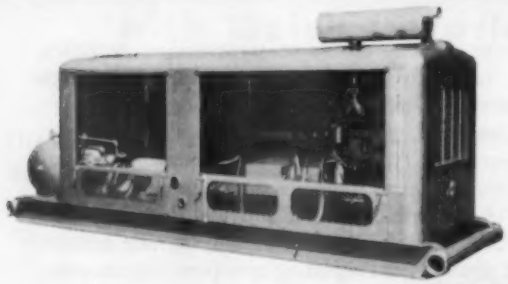
Stewart & Stevenson provides the most complete range of performance-proved engine generator sets. Combination Oil Field Utility Units, Rig Lighting Plants, A.C. Units, D.C. Units, heat exchanger cooled, radiator cooled, portable or stationary, explosion proof, standard type or custom built for any need.

Select the kind of power you prefer—Diesel, Natural Gas or LPG. Call, write or wire today for complete information on your engine generator set requirements.

**STEWART & STEVENSON SERVICES, INC.**

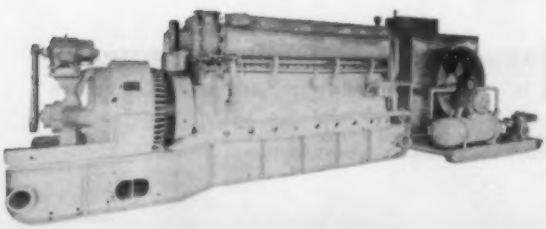
Main Office and Plant: 4516 Harrisburg Blvd.,
Phone CApitol 5-5341 Houston 11, Texas
Export: Room 1405, 74 Trinity Place, New York, N. Y.

THE WORLD'S LARGEST DISTRIBUTOR OF DIESEL ENGINES

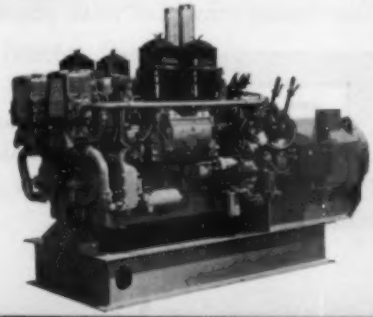


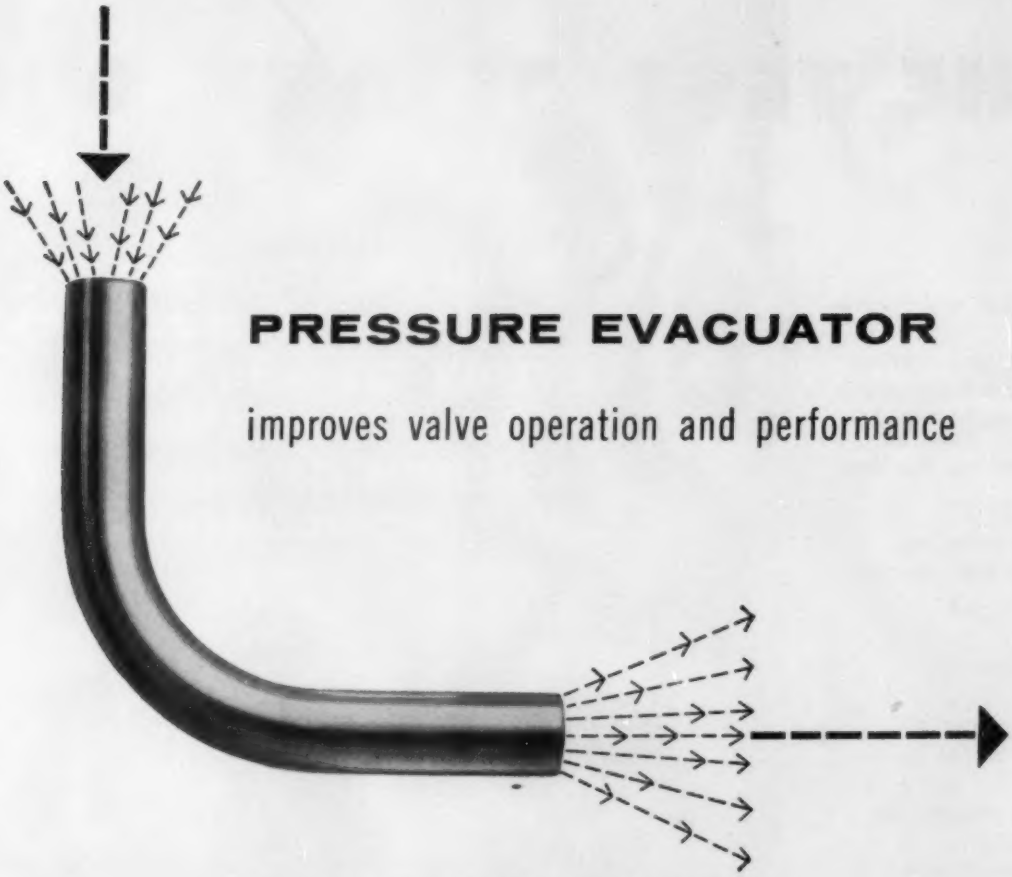
UTILITY UNIT

450 KW SKID MOUNTED



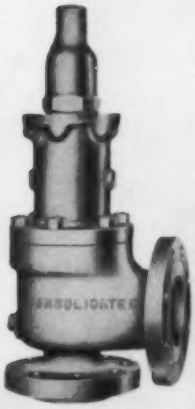
HEAT EXCHANGER TYPE





# PRESSURE EVACUATOR

## improves valve operation and performance



Consolidated Safety Relief Valve, Type 1900 Series, Sizes: 1" x 2" to 8" x 10".

The Eductor Tube in Standard Consolidated Safety Relief Valves is a pressure evacuator. It efficiently removes pressure from the closed bonnet. If allowed to remain in the bonnet, the pressure would act on the top of the disc and tend to limit the lift and induce cycling. But with the pressure evacuated from the closed bonnet through the Eductor Tube, the spring alone controls valve action. Consequently, *reliable* valve action and guaranteed capacity ratings are attained. A new high in operational dependability is assured.

Reliable operation and performance of Consolidated Safety Relief Valves are your assurance of absolute protection for personnel and equipment. "2 in 1" design permits you to convert the Standard valve to the Bellows type in your own shop. But that is only part of the total economy of these modern valves. Get the complete inside story. Write for Catalog 1900.

MANNING MAXWELL & MOORE INC. TRADE MARK

T2-58

***CONSOLIDATED SAFETY RELIEF VALVES***

***A product of***

**MANNING, MAXWELL & MOORE, INC.**

*Consolidated Ashcroft Hancock Division • Tulsa, Oklahoma*

*In Canada: Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario*

# THE TEST OF ANY PUMP

## IS IN PERFORMANCE. AND IT IS IN PERFORMANCE THAT GASOS HAVE WON THEIR PLACE AS THE NO. 1 CHOICE OF PIPELINE MEN THE WORLD OVER

**DISTRIBUTORS**

**W. L. SOMNER COMPANY**
Shreveport, Louisiana
Odessa, Texas
Tinsley, Mississippi
Brookhaven, Mississippi

•

**POWER PUMPS, INC.**
Long Beach, California

•

**PEDDLERS, INC.**
Houston, Texas

•

**PUMP ENGINEERING CO.**
Wichita Falls, Texas

•

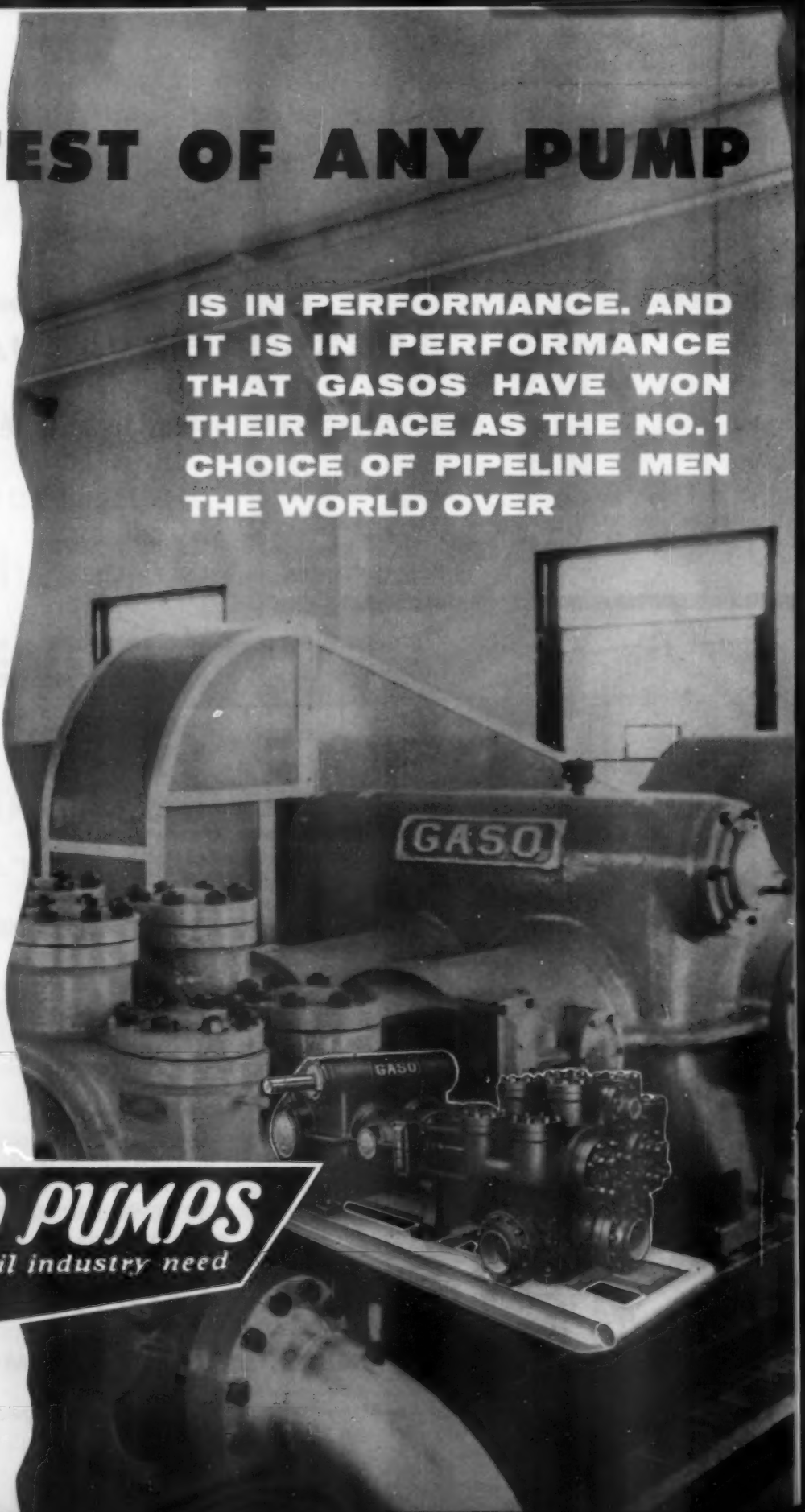
**LUFKIN FOUNDRY and MACHINE CO.**
Casper, Wyoming

•

**HAGUE EQUIPMENT CO., INC.**
Evansville, Indiana

•

**LUFKIN MACHINE CO. LTD.**
Edmonton, Alberta



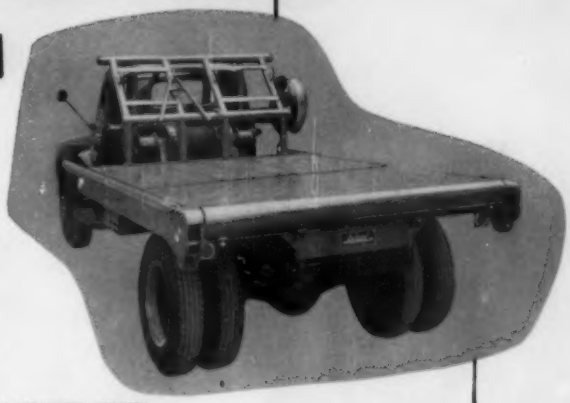

FOR FULL INFORMATION on Gaso Pumps, write for copy of our latest catalog

# GASO PUMPS
*for every oil industry need*

**GASO PUMP & BURNER MFG. CO.**
TULSA, OKLAHOMA
*Export office:* 149 BROADWAY, N.Y.

# Leland design
## with your next job in mind

FIFTH WHEEL BODY



"PACKAGED UNIT"

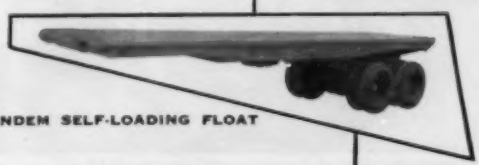
Looking ahead to the requirements of tomorrow's heavy construction is a part of Leland's business, and the advanced design of the rugged "Packaged Unit" is *rolling evidence* of anticipating our customer's needs.

This powerful, all-purpose truck body is no stranger to off-the-highway construction, for it's specifically designed and built for gin pole winching and tough terrain work. Leland's "Packaged Unit" is famous throughout the world for its flexibility and versatility of performance in the field.

For your best body buy, think ahead and look ahead. That's where you'll always find Leland waiting — way ahead!

Leland's other heavy-duty truck bodies are built for the future, too . . .

SELF-LOADING FLOAT SEMI-TRAILER



TANDEM SELF-LOADING FLOAT

POLE TRAILER

TANDEM POLE TRAILER

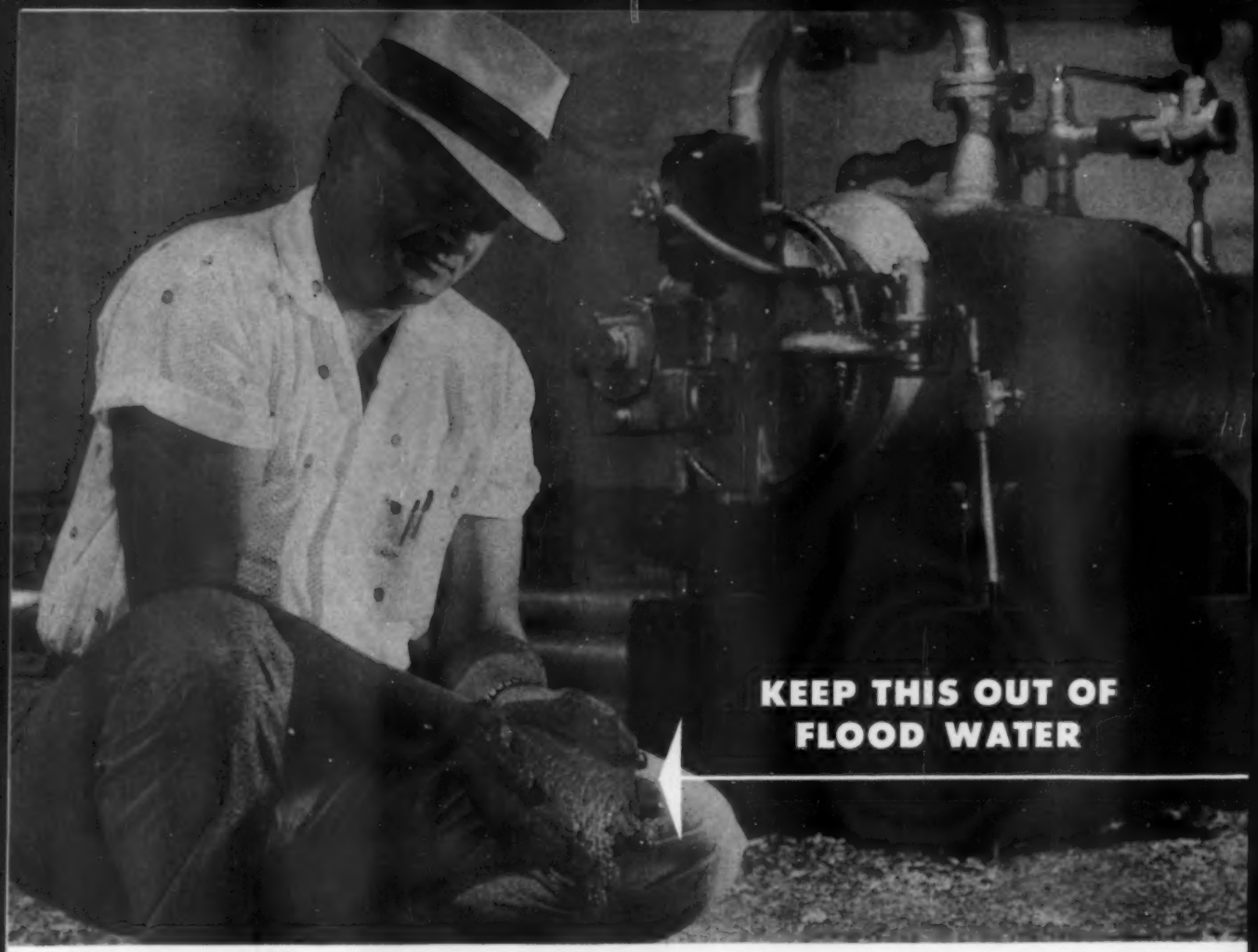
FIFTH-WHEEL BODY — RELIABLE FOR TRAILER, GIN POLE OR FLAT BED WORK. POLE TRAILERS — SINGLE AXLE & TANDEM—STREAMLINED BUT RUGGED CONSTRUCTION MEANS "SOLID SERVICE".

SELF-LOADING FLOATS. SINGLE AXLE AND TANDEM — DESIGNED FOR INCREASED PAYLOADS AND REDUCED MAINTENANCE COSTS.

**PARTS . . .**
**for Thew-Lorain, Cleveland Trenchers, Gardner Denver, Blaw-Knox, Cedarapids, C-M-C Tulsa Winches.**

**Leland**
**EQUIPMENT COMPANY**
Oklahoma City • TULSA • Longview, Texas

**SERVICE . . .**
**quick and efficient, on construction equipment parts, anywhere in the country.**




## Self-cleaning JET STRAINERS put clean water in the formation... more oil in the tank.

Clean water is a must for successful water-flooding. Injection water containing sand and other solids can form a permanent block in the formation. Workovers to remove the solids from the well bore do not always restore free circulation since a portion of the solids may enter and penetrate the formation. Additional horsepower is then required to force the flood water through the obstruction. It all adds up to a more expensive, less effective water-flood operation.

The T-C Jet Strainer has proved most successful in removing solids from flood water. Using a bare 400-mesh screen, it removes solids down to 31-micron particle size. With diotomite filteraid, it removes sub-micron solids . . . even algae and bacteria.

But that's only part of the story. T-C Jet Strainers can be cleaned and returned to service in less than five minutes. They never require backwashing. Push a button and revolving jets go into action, scouring the screen and flushing the solids out of the strainer. A pressure-differential gauge notifies the operator when the strainer needs cleaning. The cleaning operation may be made completely automatic, if desired, with electronic controls of the operator's choice.

Gallon for gallon of strainer capacity, T-C Jet Strainers cost far less than ordinary sand filters, yet they do an infinitely better job.

Got a water-flood in process . . . or planned? Let us send you full particulars on the T-C Jet Strainer. Write or wire:

**THORNHILL-CRAVER CO.**
P. O. BOX 1184 • HOUSTON, TEXAS

SELF-CLEANING
**JET STRAINER**

*New El Paso pipeline terminal warehouse for El Paso Natural Gas Products Co. is a column-free 80' x 100' Stran-Steel Rigid Frame building with colorful blue walls in Stran-Satin Color, a new factory applied baked-on vinyl-aluminum coating.*

## Stran-Steel Warehouse with Factory-Applied Stran-Satin Blue Exterior

# 8,000 SQUARE FEET . . . NO COLUMNS!

Now you can order a Stran-Steel building for your exact needs—and in your choice of colors, too! Yes, *Stran-Satin Color* is now available in blue, green, bronze, rose, gray and white—and not just brushed on, but factory applied at the source. *Stran-Satin Color* is a new exclusive baked-on vinyl-aluminum coating which becomes an integral part of the panel. It will not blister, peel or sunfade—outlasts paint for years and years, all the while virtually maintenance-free.

Ideal for oil field warehousing and storage, pipeline station, laboratory, or maintenance and service facility. The open clear-span design of the Rigid Frame also meets requirements for housing large tanks, vats and associated piping required for petrochemical processing operations.

Stran-Steel buildings give permanent all-weather protection, low maintenance expense and greater fire safety. Custom-tailored to your specifications, yet mass-produced to keep the cost low! And Stran-Steel precision engineering speeds erection so the exact size building you want is ready for use in weeks, sometimes days, for operations at even the most isolated sites. Field-proven Stran-Steel buildings can be readily expanded or altered. They can be dismantled and reassembled on other sites with almost complete reclamation.

You can own any one of the complete line of Stran-Steel buildings, including the low-priced Stran-Master all-steel pole type building, for as little as 25 percent down payment. Finance the balance over a 5-year period, through your local dealer. For detailed information, mail the coupon or call your Stran-Steel dealer. He's listed in the Yellow Pages under *Steel Buildings* or *Buildings-Steel.*

**Stran-Steel Corporation, Dept. 41-59**
**Detroit 29, Michigan**

☐ Please send your Industrial Buildings Catalog.

☐ Please send your catalog on Stran-Steel Buildings in Factory-Applied Colors.

Name_____

Title_____

Company_____

Address_____

City_____ Zone____ State_____

Dept. 41-59

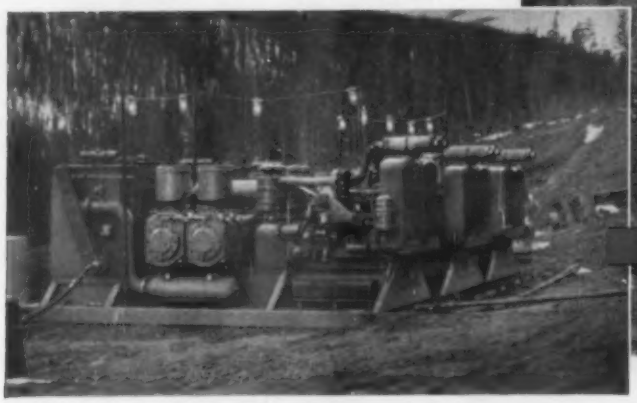
Stran Steel

**STRAN-STEEL CORPORATION**

Detroit 29, Michigan • Division of

NATIONAL STEEL CORPORATION

Three Ingersoll-Rand packaged compressor plants serving a drilling rig in a remote, mountainous area of Canada, where dependability and freedom from maintenance are vital.



# NEW compressor package for AIR DRILLING

## ...a rugged field-ready unit for continuous operation

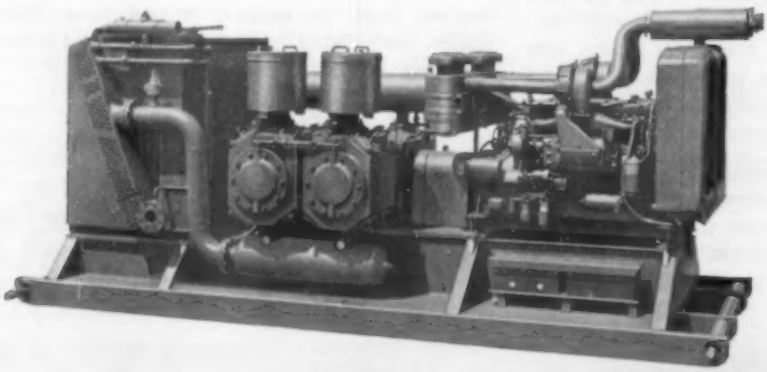
Here is a new skid-mounted compressor plant *designed for* air drilling—to give the air you need at the pressures you need, 24 hours a day for weeks. Just truck it to your drilling site, hook it up, and you're in business!

**COMPLETELY SELF-CONTAINED**—Skid-mounted unit contains heavy-duty Ingersoll-Rand balanced-design, two-stage HHE compressor; General Motors Twin 6-71 turbocharged diesel engine; combination forced-air cooler; all auxiliaries and controls. No extras to buy.

**FAST, EASY STARTUP**—Unit is so well-balanced and vibration-free that it needs no foundation; just set it on timbers, connect fuel line and discharge air lines and start it. It stays put and stays running.

**COMPLETELY AUTOMATIC, SELF-PROTECTING**—Adjustable regulator automatically maintains desired pressure; shifts from idling to running speed and loads or unloads compressor as required. Both engine and compressor are arranged for automatic shutdown in case of any malfunction.

**LOW-COST MAINTENANCE**—Self-protecting features enable operator to correct any trouble at source before damage is caused; maintenance is kept on simple preventive basis. World-famous Ingersoll-Rand Channel Valves give long, trouble-free service with sustained efficiency. Filtered, full force-feed lubrication systems for engine, compressor running gear and compressor cylinders keep wear to minimum.



Contact your Ingersoll-Rand representative now for more information on this new unit. It will make money for you by speeding your job.

**Ingersoll-Rand**

1-868 11 Broadway, New York 4, N. Y.

COMPRESSORS • GAS & DIESEL ENGINES • PUMPS • AIR & ELECTRIC TOOLS • CONDENSERS • VACUUM EQUIPMENT • ROCK DRILLS

# STOP INTERNAL PIPE-LINE CORROSION!

## CHANGE THIS

Corrosion-clogged pipe costs you money in down time, frequent scrapings, lost throughput, and discolored product.

## TO THIS

This smooth interior surface means improved "C" factor, restored throughput.

## with KONTOL 77 CORROSION INHIBITOR

Kontol-protected pipe eliminates the need for higher pump pressures to maintain throughput, requires fewer scrapings and avoids corrosion contamination of your products. Kontol 77 meets military specifications for use in jet fuels and automotive gasolines.

**SEE WHAT KONTOL 77 DID FOR THIS PIPE LINE**

| | Date | "C" Factor | Use of Pigs |
|---|---|---|---|
| BEFORE KONTOL 77 | May | 125 | 4 knife scrapers, 1 brush scraper |
| | June | 125 | 10 knife scrapers, 1 brush scraper |
| | July | 127 | 6 knife scrapers |
| | August | 130 | 20 knife scrapers |
| | September | 132 | 26 knife scrapers |
| | October | 138 | 18 knife scrapers |
| KONTOL 77 WAS USED HERE! | December | 141 | 14 knife scrapers |
| | February | 141 | 6 knife scrapers |
| | February (following year) | 141 | NO SCRAPERS FOR ENTIRE YEAR! |

TRETOLITE COMPANY KONTOL SAINT LOUIS LOS ANGELES

**See your Kontol Service Engineer soon!**

*Chemicals and Services for the Petroleum Industry*

DEMULSIFICATION • DESALTING • CORROSION INHIBITING
PARAFFIN REMOVAL • SCALE PREVENTION
WATER DE-OILING • INJECTIVITY STIMULATION

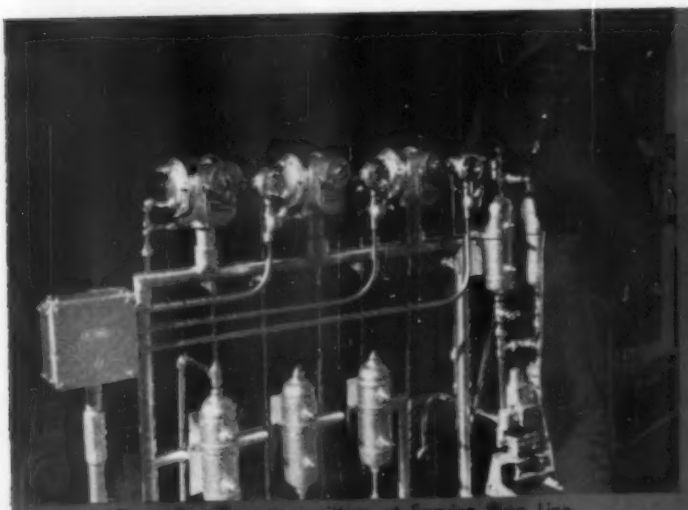
KPL-58-2

**TRETOLITE COMPANY**

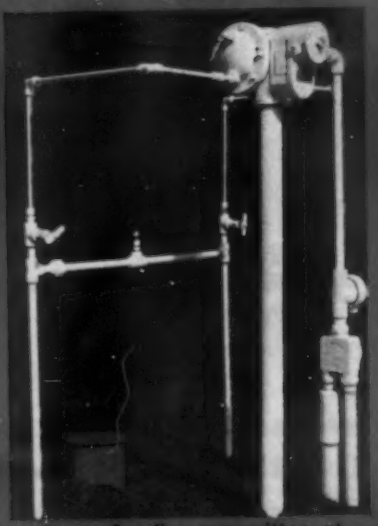
DIVISIONS OF PETROLITE CORPORATION

[illegible] Marshall Ave. • St. Louis 19, Mo.
[illegible] Telegraph Road • Los Angeles 22, Cal.

# pressure and flow data

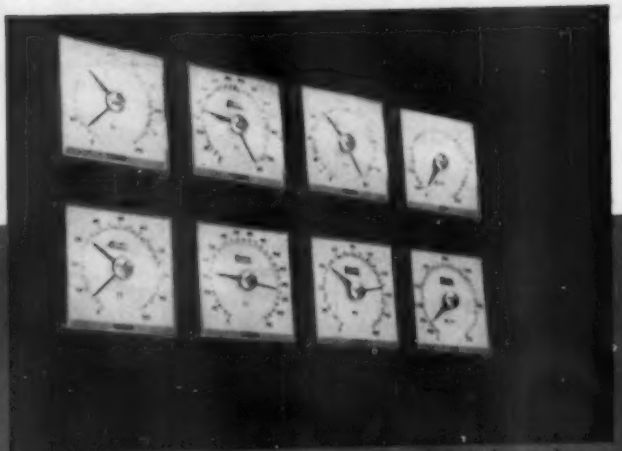


ElectroSyn flow transmitters at Service Pipe Line Company's pumping station, Drumright, Oklahoma.



ElectroSyn flow transmitters at Service Pipe Line's Blake Station (Washington County, Oklahoma)

Satellite data logging of pressures and flows at Drumright Station.



ElectroSyn flow and pressure indicators and digital encoders at Blake Station.

# 3 to 4 times more accurate with

NORWOOD CONTROLS

# ELECTROSYN

Norwood Controls' ElectroSyn digital telemetering transmitters are playing an important part in digital data handling for leading pipeline companies. The ElectroSyn System's digital approach automatically makes available — for logging — pressure and flow information with 3 to 4 times greater accuracy than can be attained by use of analog equipment. This increased accuracy results in considerably higher overall operating efficiency.

Digital pressure and flow values are transmitted in encoded form from pumping stations along the line to central logging points by data handling and checking equipment.

The ElectroSyn null-balance System consists of electro-magnetic transmitters and feedback units combined with magnetic amplifiers. Servo-indicators actuate adjustable high and low alarm contacts which are visible and can be set from the front of the instrument. Shaft positions of the servos are read out by encoders . . . linear encoders for pressure and square law encoders for flow. Additional encoders can be actuated to provide rate-of-change alarms.

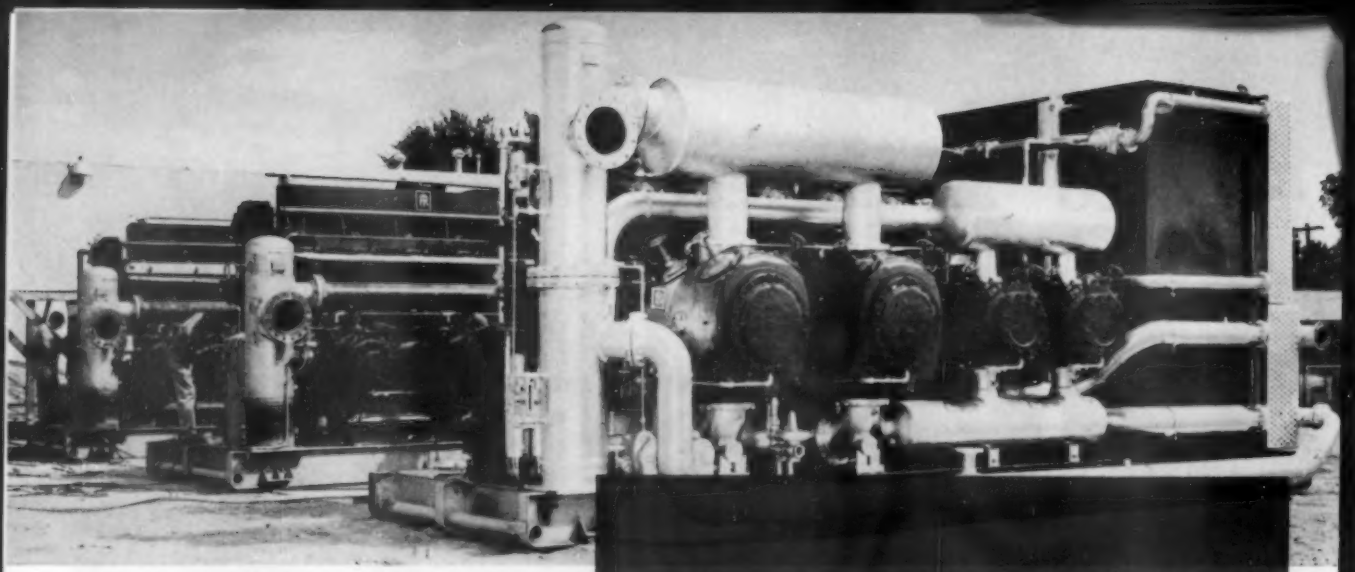
More and more pipeline companies are choosing ElectroSyn Systems because they offer:

- Higher reliability
- Lower maintenance
- Flexibility of application
- Rugged electro-magnetic system
- Can withstand static overload of 200% of rated pressure with no zero shift
- Remote transmission
- Explosion-proof transmitters.

*Write for ElectroSyn Bulletin B257 — Norwood Controls Unit, Detroit Controls Division, 942 Washington St., Norwood, Mass.*

AMERICAN-Standard

DETROIT CONTROLS DIVISION



# THERE'S MORE FLEXIBILITY IN THESE PACKAGE COMPRESSORS

Stearns-Roger's extensive manufacturing facilities and gas engineering personnel are exclusively responsible for your packaged compressor plant, from quotation to on-site operation. Our complete service assures you of a plant "custom built" to utmost efficiency and economy for the precise conditions of your field.

Each rugged, compact unit, with the compressor of your choice, is completely design-engineered just as are much larger permanent field installations. Stearns-Roger Packaged Compressor Plants provide quick, easy installation and substantially automatic operation. For every important service — process engineering, custom fabrication, field erection...

***Ask for our Packaged Compressor Plant Bulletin, covering units from 100 H.P. up.***

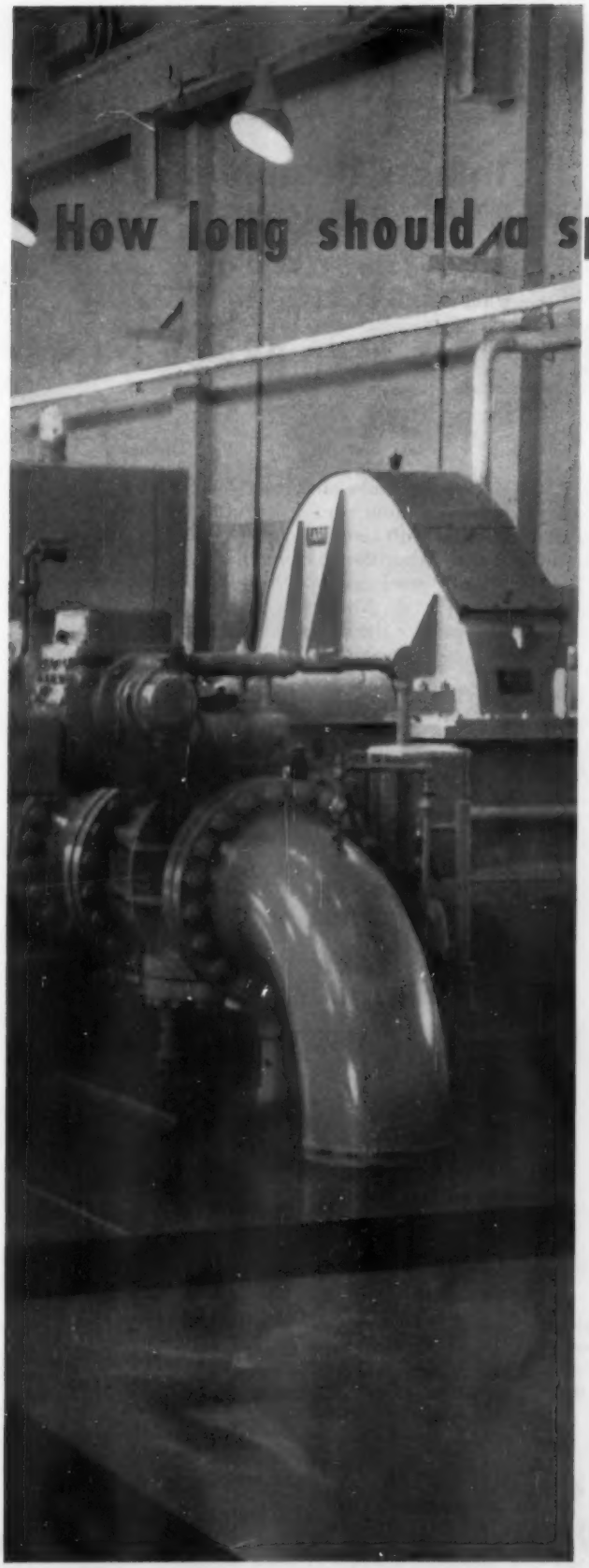
**TAKE IT UP WITH**

**Stearns-Roger**

THE STEARNS-ROGER MFG. CO. • DENVER, COLORADO

DENVER • HOUSTON • EL PASO • SALT LAKE CITY

Stearns-Roger Engineering Co., Ltd. Calgary



# How long should a speed increaser last?

True, there is no firm and fast rule for predicting how long a speed increaser will last in pipeline service. There are, however, some dependable clues. Most practical of all is performance under actual operating conditions.

How do Farrel speed increasers measure up when this service yardstick is applied? The answer is on record: Since 1932, when the first of these units was placed in operation, not one has ever been taken off the job. *This indicates that the life expectancy — or average service life — of a Farrel speed increaser is not less than 25 years!*

Design features tell the story. For example, teeth are continuous across the full face width of each gear — paying off in bonus strength and load-carrying capacity. Oversize shafts guard against torsional deflections under peak torque variations. Shafts are mounted in husky, precision-finished bearings. The rigid housing preserves original alignment of moving parts.

When you're in the market for speed increasers, remember the extra stamina that's built into every Farrel unit. It's your assurance of long-range speed-increasing economy.

In the meantime, send for a copy of bulletin No. 451.

**FARREL-BIRMINGHAM COMPANY, INC.**
ANSONIA, CONNECTICUT

*Plants:* Ansonia and Derby, Conn., Buffalo and Rochester, N. Y.

*Sales Offices:* Ansonia, Buffalo, Boston, Akron, Ann Arbor (Mich.), Chicago, Minneapolis, Los Angeles, Salt Lake City, Houston, Tulsa, Fayetteville (N. C.)

*European Office:* Piazza della Republica 32, Milano, Italy

*Farrel-Birmingham*®

FB-1109

# Timken® seamless steel tubes with 125,000 psi yield strength let you drill as deep as you want

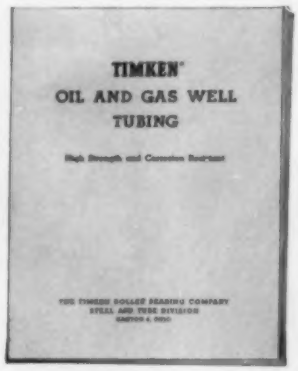
IMAGINE a steel tube so strong you can drill as deep as you want—without pressure problems. Timken® seamless steel tubes with yield strength of 125,000 psi, are 20% stronger than the stiffest API requirement (5A). They can take internal pressures up to 15,000 psi. The well hasn't been drilled yet that this tubing can't handle. Timken seamless steel tubes are the tubes for the increased pressures of the wells you're planning for the future.

When you specify Timken seamless steel tubes, you get a steel of exceptional uniformity and ductility. And to lick your corrosion problems, you can choose from a wide range of analyses to get just the right grade to resist the particular operating conditions you're faced with.

Timken Company metallurgists will be glad to help you select the right steel to do the job. Why not take advantage of their experience—24 years of making high pressure seamless tubes for thousands of special requirements.

**FREE ENGINEERING STUDY**

You may get some money-saving ideas from this review of alloy properties for high-strength and corrosion-resistant steel tubes. Get your free copy of "Timken Oil and Gas Well Tubing." Write today! The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".



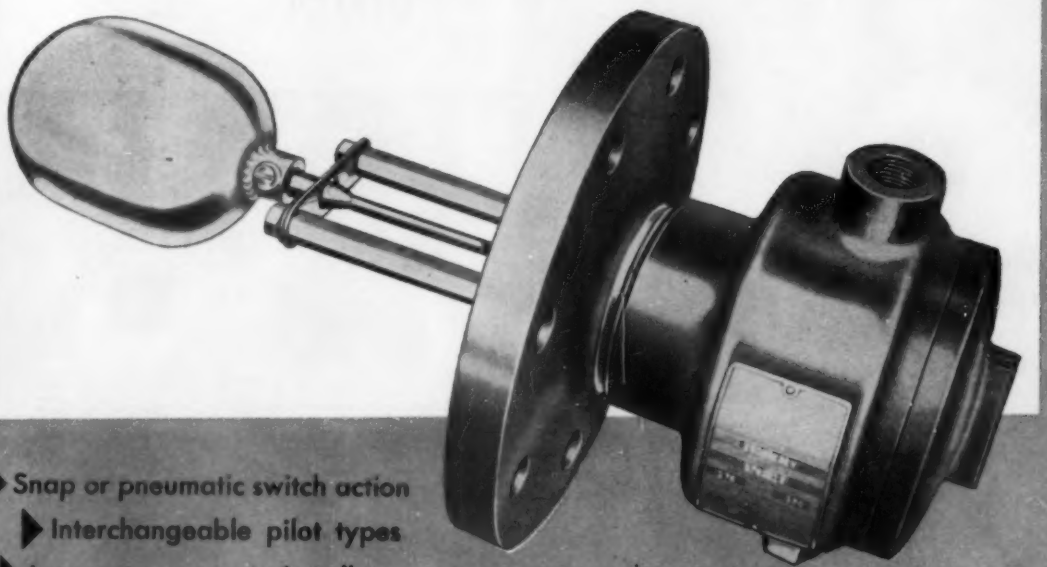

# TIMKEN *Fine Alloy* STEEL

TRADE-MARK REG. U.S. PAT. OFF.

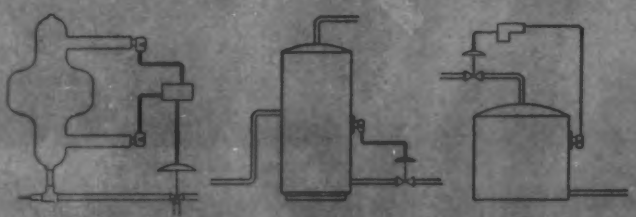
SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS STEEL TUBING

# Series 2800—The oil man's Level Controller for Lease Automation

# FISHER



- Snap or pneumatic switch action
- Interchangeable pilot types
- Low cost . . . easy to install



Type 2806-252V controlling level of volumetric measurement vessels for accurate control of liquid volume.

Separator or line scrubber control

High level shut-in control in tank farms

**252V HOUSING ASSEMBLY**

Sizes—4" iron or steel, flanged, with ratings up to 900# ASA. Available with coupling type, welding type or screwed bar housing. Float size 3½" x 6" stainless steel. Pressures up to 1000 psi. Solid plastic available for pressures over 1000 psi. Flexure tube—K Monel.

**PILOT ASSEMBLIES**

Type 2800—Explosion-proof electric switch assembly—snapping range—½"—1" with 1.0 specific gravity liquid. Electrical rating—20 amp., 125, 250, 440 volt AC. Color coded wiring.

Type 2806—Pneumatic relay with snapping range of ½" to 1¼", with 20 psi air supply.

Type 2807—Pneumatic relay for throttling service. Available with horizontal or vertical floats for wide range of proportional band requirements.

The float actuated 2800 series is a low cost, snap acting liquid level control available with either electric (explosion-proof) or pneumatic switch action. Pilot is interchangeable on float housing assembly. Features the stab-in type of tank mounting for easier installation.
Write for Bulletin F2800 for complete information.

IF IT FLOWS THROUGH PIPE ANYWHERE IN THE WORLD...CHANCES ARE IT'S CONTROLLED BY...

**FISHER GOVERNOR COMPANY**

Marshalltown, Iowa / Woodstock, Ontario / London, England

FISHER® Controls

SINCE 1880

# Men like RUDY KOMNENOVICH make the difference!

Pipe coatings "stick around" permanently when Rudy Komnenovich is on the job. Rudy's years of experience as a coating machine operator give him the "know how" that's needed to do the job *right!* Because of Rudy, and the men who work with him, the Hill-Hubbell name has become the most respected in the pipe coating and wrapping industry. Hill-Hubbell's factory trained craftsmen make it *their* business to give your pipe perfect protection . . . permanently! So, for the guaranteed precision of factory application and factory-control by experts . . .

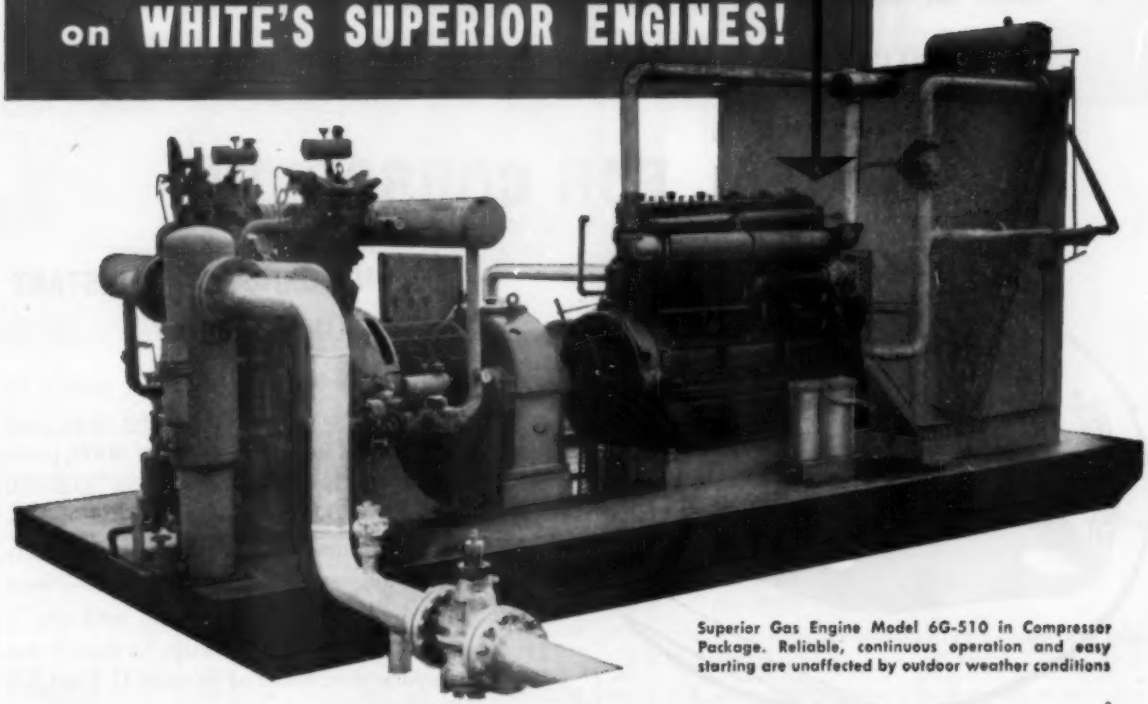
**Specify Hill-Hubbell wrapped pipe on your next job**

## HILL·HUBBELL & COMPANY

DIVISION OF GENERAL PAINT CORP. • 3091 MAYFIELD ROAD, CLEVELAND 18, OHIO

FACTORY APPLICATORS OF COATINGS AND WRAPPINGS

# *Here's Proof*...you can depend on WHITE'S SUPERIOR ENGINES!



Superior Gas Engine Model 6G-510 in Compressor Package. Reliable, continuous operation and easy starting are unaffected by outdoor weather conditions

## more than *50,000 Hours Continuous Operation!*

## no major overhaul or part replacement!

Service records show Superior's first major repair usually comes due long after other engines would be completely replaced . . . over 50,000 hours continuous operation has been reported with no major overhaul or major part replacement required. White's extreme design simplicity makes this possible. High mortality parts are eliminated, thus prolonging engine life and reducing repairs and maintenance. Relatively few cylinders and internal parts supply power equal to other engines having more cylinders and more complex design. Precision construction and advanced engineering refinements reduce wear on all parts and guarantee low lube oil consumption. Highly developed, rugged, open chamber combustion system assures maximum fuel economy and also exclusive operation on non-premium fuels. Cost-per-horsepower operation is much lower than comparable models in the same power range. Conservative horsepower ratings allow plenty of reserve to meet extreme operating conditions.

### It all adds up... Superior is the engine you can count on!

Diesel, dual-fuel or gas engines range from 190 to 2150 H.P. Portable or stationary generator sets range from 150 to 1500 KW. For pipe line pumping, gas compressor drive and power generation, specify modern, compact, powerful Superior engines . . . field-proven in hundreds of oil field applications! Write today for additional information!

Superior ENGINES · ATLAS Imperial DIESEL ENGINES · White DIESEL

# *White Diesel*

**WHITE DIESEL ENGINE DIVISION**
**THE WHITE MOTOR COMPANY**
*Plant and General Offices: Springfield, Ohio*

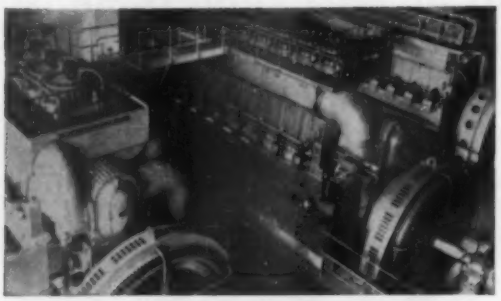
# ENGINEERING

**NEWS YOU CAN USE ABOUT ENGINE AND COMPRESSOR PERFORMANCE**

## BIG MEAL FOR CORROSION!

### INSIST ON CORROSION-RESISTANT COOK PACKING GLANDS

Even in the very toughest service, there's no excuse for rust and corrosion eating away your packing glands. In 999 cases out of 1000, packing glands of Cook stainless steel or *Ni-Resist* type iron will solve the problem. For the remaining 1 problem in 1000, Cook can probably design an answer. That's because C. Lee Cook pioneered in the field of metallic packings — knows more about their specific, on-the-job use than anyone else. Insist on genuine C. Lee Cook parts and service.



### COOK RINGS IN DIESEL SERVICE 3 YEARS—STILL GOING STRONG

Here's a report on Cook rings at Rockville Centre, N. Y. municipal power plant. It's the result of a cylinder inspection on their No. 8 diesel unit after nearly three years of continuous operation.

**"While several rings were replaced in Grooves 1 and 2, Cook rings in Grooves 3, 4, 5 and 6 could run for another 10,000 hours! And cylinders averaged less than .001" maximum wear per 1000 hours of operation."**

### "Piston Rings and Engine Power"

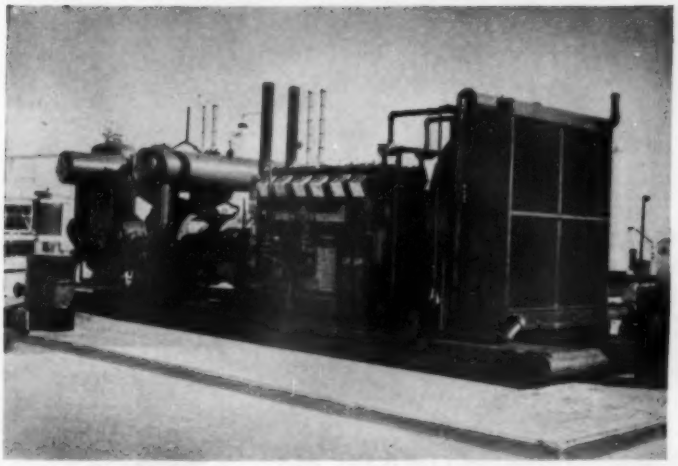
**SEND FOR FREE 8-PAGE BOOKLET!**

Write for your free copy of this technical article on the importance of keeping piston ring faces to the wall... an informative study of the effects of piston ring problems on the various types of engines and their operation. Write C. Lee Cook Company, 934 South 8th Street, Louisville 3, Kentucky.

**C. LEE COOK COMPANY**

Division of Dover Corporation

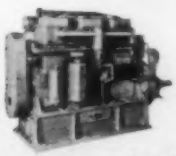
*Rings and Packings Since 1888*



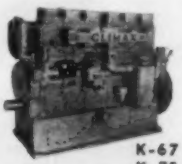
FOR POWERING COMPRESSORS

| HORSEPOWER RATINGS[1] | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Model | No. of Cyls. | Bore and Stroke | Cu. In. Displ. | WITH Radiator and Fan | | | | WITHOUT Radiator and Fan | | | |
| | | | (2) | 800 | 900 | 1000 | 1030 | 800 | 900 | 1000 | 1030 |
| R-165 | 6 | 6½x7 | 1238 | 85 | 95 | 103 | 105 | 90 | 101 | 110 | 113 |
| K-67 | 6 | 7x7 | 1616 | 118 | 131 | 143 | 146 | 122 | 137 | 150 | 154 |
| K-75 | 6 | 7½x7 | 1855 | 135 | 151 | 166 | 169 | 139 | 156 | 172 | 176 |
| V-80 | 8 | 7x7 | 2155 | 153 | 171 | 187 | 190 | 157 | 177 | 195 | 200 |
| V-85 | 8 | 7½x7 | 2474 | 181 | 200 | 216 | 221 | 186 | 206 | 224 | 230 |
| V-122 | 12 | 7x7 | 3232 | 238 | 265 | 288 | 293 | 244 | 272 | 298 | 304 |
| V-125 | 12 | 7½x7 | 3711 | 276 | 312 | 340 | 346 | 284 | 319 | 350 | 357 |

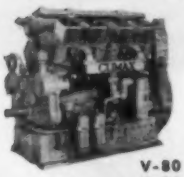
(1) These are continuous duty (65%) ratings.
(2) R.P.M.



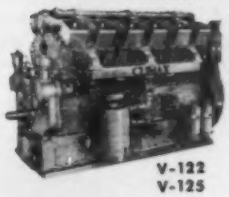
R-165



K-67
K-75



V-80
V-85



V-122
V-125

# OUTSTANDING ENGINE VALUES

## IN THE OIL INDUSTRY

**Here's Why**

1. All models have a 7" stroke.
2. All main and connecting rod bearings are the precision type.
3. All intake and exhaust valves are the free-to-rotate type.
4. All cylinder blocks are provided with renewable sleeves (except R series).
5. All cylinder blocks are cast separate from the crankcase.
6. All pistons are aluminum, cam ground and have five (5) rings.
7. All crankshafts have a main bearing on each side of each crankthrow (except R series).
8. All connecting rods are rifle-drilled for pressure lubrication of piston pins (except R series).
9. All cylinder heads have Climax high turbulence type combustion chambers which produce maximum fuel economy.
10. All crankcases and engine bases have large hand holes on each side for easy access to main and connecting rod bearings and the oil pump.
11. All models have the Climax consistent design that makes possible maximum interchangeability of wearing parts.

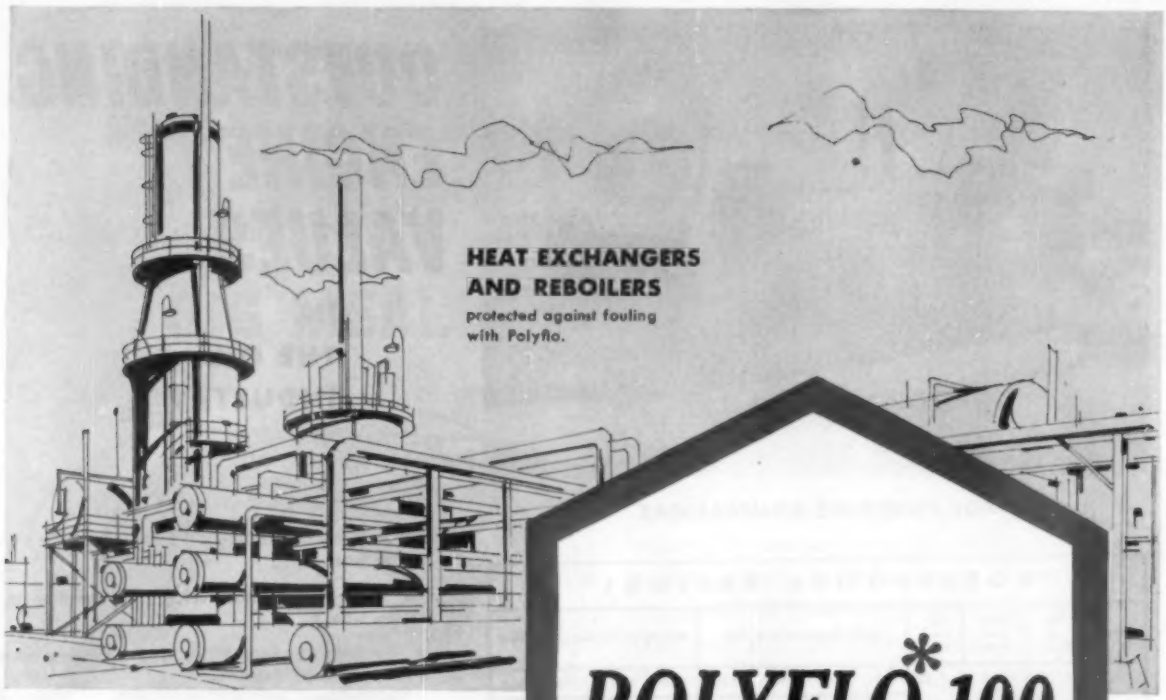
**These important features mean less down time, easier and faster field servicing and lower maintenance costs.**

•

**Ask your nearby Climax Distributor for full details today!**

# CLIMAX ENGINE MANUFACTURING CO.
# DIVISION OF WAUKESHA MOTOR COMPANY

**FACTORY—CLINTON, IOWA**



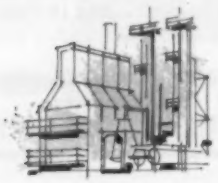

# NOW... POLYFLO* 100

## 1 Multi-purpose Inhibitor-dispersant solves 5 pressing problems

A highly convenient all-around inhibitor-dispersant, UOP Polyflo 100 is also an effective stabilizer against thermal changes, color deterioration, sludge and deposit formation.

An effective dispersant for distillate, residual and crude oils, Polyflo 100 also eliminates fouling and sludge formation in heat exchangers and storage tanks.

Polyflo is but one of a variety of inhibitors and additives developed by UOP for petroleum refiners. Write our Products Department for detailed information on these products. Ask also about the services of our staff of treating field engineers, who will gladly work with you to solve specific problems.



**No. 2 HEATING OIL**
stabilized against color deterioration and sludge deposition.

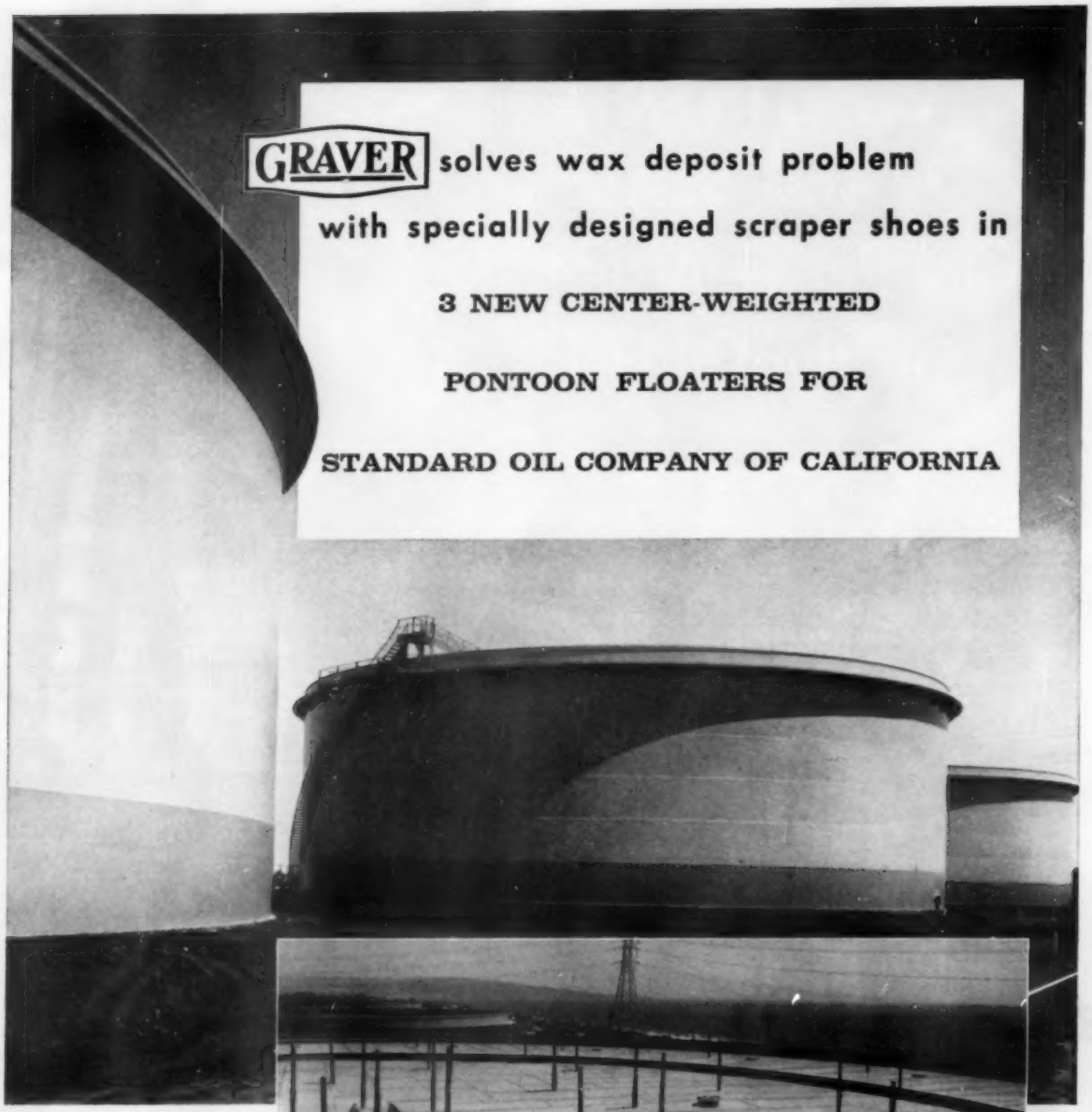
**DIESEL FUELS**
also effectively stabilized with Polyflo.

**OIL STORAGE TANKS**
for distillate, residual and crude oils—kept free of tank bottoms.

**JET FUELS**
attain thermal stability with Polyflo.

* TRADEMARK

**UNIVERSAL OIL PRODUCTS COMPANY**
30 ALGONQUIN ROAD, DES PLAINES, ILLINOIS, U.S.A.



**GRAVER** solves wax deposit problem with specially designed scraper shoes in

3 NEW CENTER-WEIGHTED PONTOON FLOATERS FOR STANDARD OIL COMPANY OF CALIFORNIA

*Another Example of Graver's Design and Engineering Leadership*

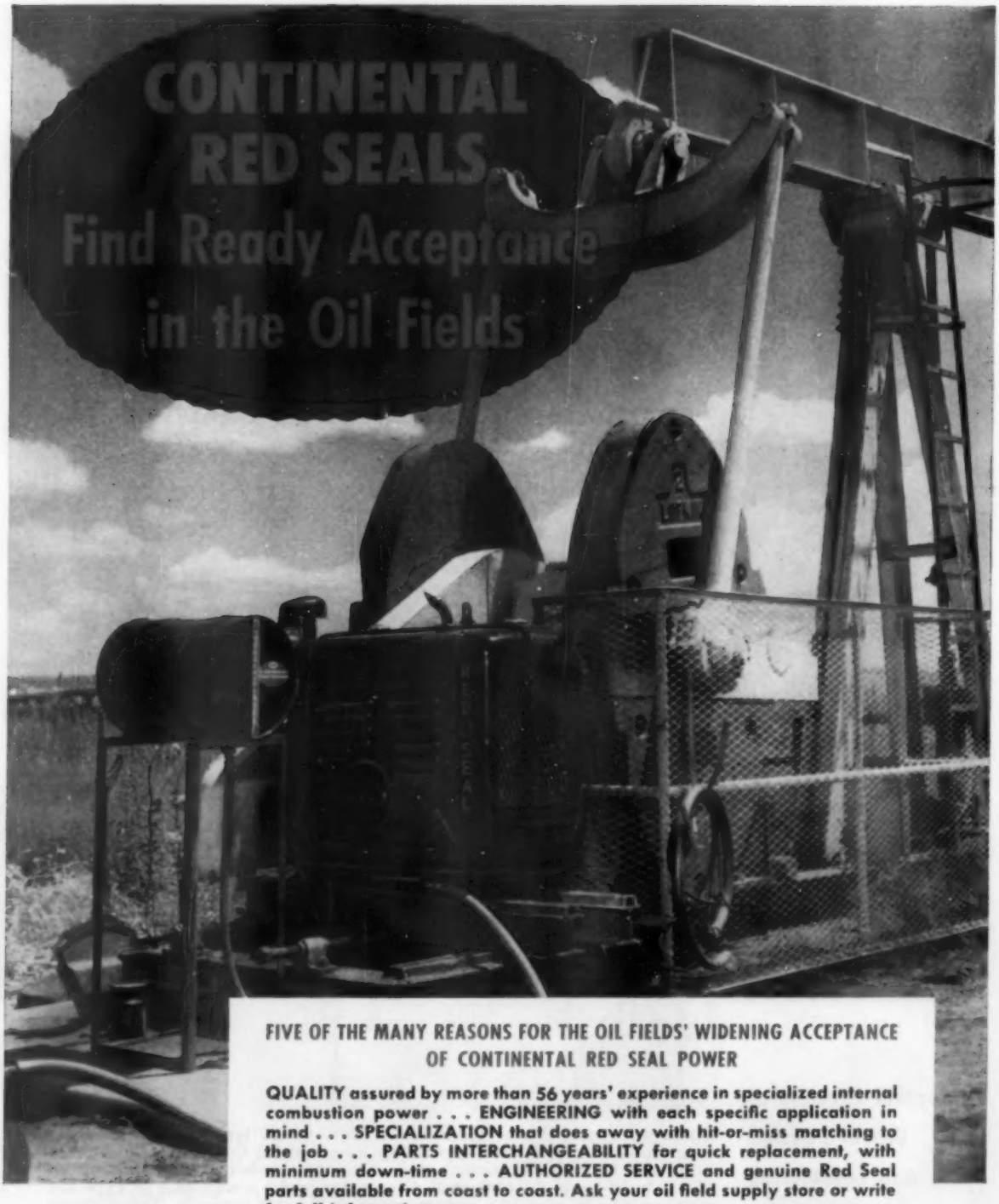
These three new Graver 160,000 bbl. floating roof tanks, with the center weight *under the deck*, were selected by Standard Oil Company of California as suitable for high wax content crude. This type crude may create a problem of wax build-up on the tank shell. Graver designed a special shoe of Type 304 stainless steel to provide a scraper action as the roof descends. This stainless shoe and the unique, lower-cost under-deck center-weighted roof design are examples of Graver's imaginative design and engineering leadership.

GRAVER®

*Building for the Future on a Century of Craftsmanship in Steels and Alloys*

GRAVER TANK & MFG. CO., INC.

EAST CHICAGO, INDIANA • New York • Philadelphia
Edge Moor, Delaware • Pittsburgh • Atlanta • Detroit • Chicago
Tulsa • Sand Springs, Oklahoma • Houston • New Orleans
Los Angeles • Fontana, California • San Francisco




FIVE OF THE MANY REASONS FOR THE OIL FIELDS' WIDENING ACCEPTANCE OF CONTINENTAL RED SEAL POWER

**QUALITY assured by more than 56 years' experience in specialized internal combustion power . . . ENGINEERING with each specific application in mind . . . SPECIALIZATION that does away with hit-or-miss matching to the job . . . PARTS INTERCHANGEABILITY for quick replacement, with minimum down-time . . . AUTHORIZED SERVICE and genuine Red Seal parts available from coast to coast. Ask your oil field supply store or write for full information.**

●

6 EAST 45TH ST., NEW YORK 17, NEW YORK • 3817 S. SANTA FE AVE., LOS ANGELES 58, CALIF.
6218 CEDAR SPRINGS ROAD, DALLAS 9, TEXAS • 1252 OAKLEIGH DR., EAST POINT (ATLANTA) GA.

CONTINENTAL MOTORS ® Powerful as the Nation AMERICA'S STANDARD

Continental Motors Corporation

MUSKEGON • MICHIGAN

## TAPPING SLEEVES AND VALVES

For making lateral connections to existing cast iron lines. Calked or mechanical joint type. Sizes to 12".

## EXTENSION STOPPER FITTINGS

Used with tapping sleeves or crosses to make lateral connections to existing cast iron lines. Mechanical joint outlet. Sizes 4", 6" and 8".

## EXTENSION STOPPER FITTINGS

Provide another means by which lateral connections can be made. Sizes 1½" and 2" for service pressures to 1200 p.s.i. Sizes 3", 4", 6" and 8" for pressures to 230 p.s.i.

## N. R. S. GATE VALVES

Bronze mounted iron bodies. Conventional packing on all sizes or "O" ring stem seals on sizes to 36". Double disc, parallel seat type. Sizes 2" to 48". Variety of ends.

## O. S. & Y. GATE VALVES

Conventional packing. Double disc parallel seat type. Iron bodies, bronze mounted. Hub and flanged end sizes 2" to 48". Screwed end sizes 2" to 8".

## SAVE-A-VALVE DRILLING NIPPLES

Permit recovery of expensive valves from temporary or semi-permanent connections. Sizes ¾" to 8". Working pressures to 1200 p.s.i. on sizes to 6", 230 p.s.i. on 8" size.

## FLANGED TEES

Used for making large lateral connections to the top of lines. Sizes 3", 4", 6" and 8", 230 p.s.i. working pressure. 1200 p.s.i. working pressure for 4" and 6" size.

# MUELLER®

## NO-BLO® PRODUCTS

For oil and gas piping systems

Over 100 years of engineering and manufacturing experience are incorporated in the design of each Mueller product. Especially designed for their particular applications and with careful consideration given the overall system, Mueller products provide a system of components matched in quality and performance.

**MUELLER CO.** DECATUR, ILL.

Factories at: Decatur, Chattanooga, Los Angeles; In Canada: Mueller, Limited, Sarnia, Ontario

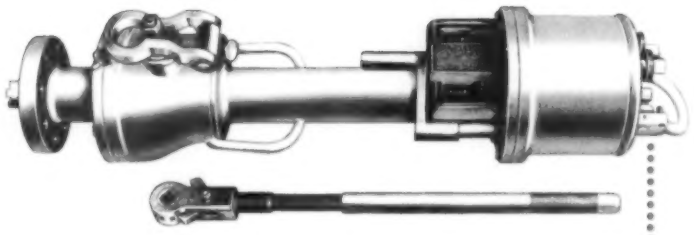
Form Number PI-8878

Printed in U.S.A.

# MUELLER®

## NO-BLO® METHOD

*machines and equipment...*



Mueller No-Blo Method equipment provides a means for connecting branch lines, repairing or replacing line sections, and adding new connections, all safely under pressure, with no escape of fluid. All operations can be completed quickly and safely, without interrupting service.

### CH-6 DRILLING MACHINE

New! Automatic! New improved design and new features assure faster, safer cuts. Direct reading indicators show tool position at all times. Over-travel protection and easily set feed means quicker, simpler operation. Cuts 2" to 6" under pressures up to 1440 p.s.i. at 100° F. 24" boring bar travel.

### DH-2 DRILLING MACHINE

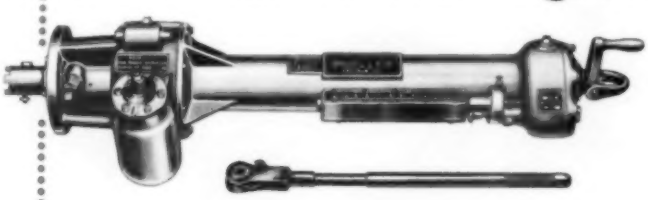
Drills holes from ¼" to 2⅛" under pressures to 1200 p.s.i. at 100° F. Travel length is 14". Hand or power operated.

### EH-1 DRILLING MACHINE

Balanced pressure design. Drills ¼" to 1" under pressures to 1200 p.s.i. at 100° F. 9⅞₁₆" boring bar travel. Hand operated.

### NO. 3SW LINE STOPPER UNIT

Maintain flow while tying-in 4", 6" and 8" lines, with two H-17340 Stopping Machines and one H-17346 Completion Machine. Maximum pressure: 230 p.s.i. at 100° F. No. 4SW Unit available for stopping off 10" or 12" lines.



### C1-36 DRILLING MACHINE

Make tie-ins under pressure by drilling through tapping sleeves and valves, flanged tees, or Save-a-Valve Drilling Nipples. Power driven C1-36 makes cuts 2" through 12½" under pressures to 500 p.s.i. at 100° F. 36" boring bar travel.

*Write direct for complete information on Mueller NO-BLO® products designed and manufactured specifically for the oil and gas industries.*

**MUELLER CO.** **DECATUR, ILL.**

MUELLER CO. Since 1857 Helping the Water and Gas Industries QUALITY

Factories at: Decatur, Chattanooga, Los Angeles; In Canada: Mueller, Limited, Sarnia, Ontario

# BLUE FLAG®

## PIPELINE REINFORCING WRAP

*Finest Quality Under the Earth*

uniform porosity allows enamel to bleed through quickly, gases to escape

increases enamel's resistance to cracking and backfill damage

special glass resists water and soil chemicals to help fight corrosion.

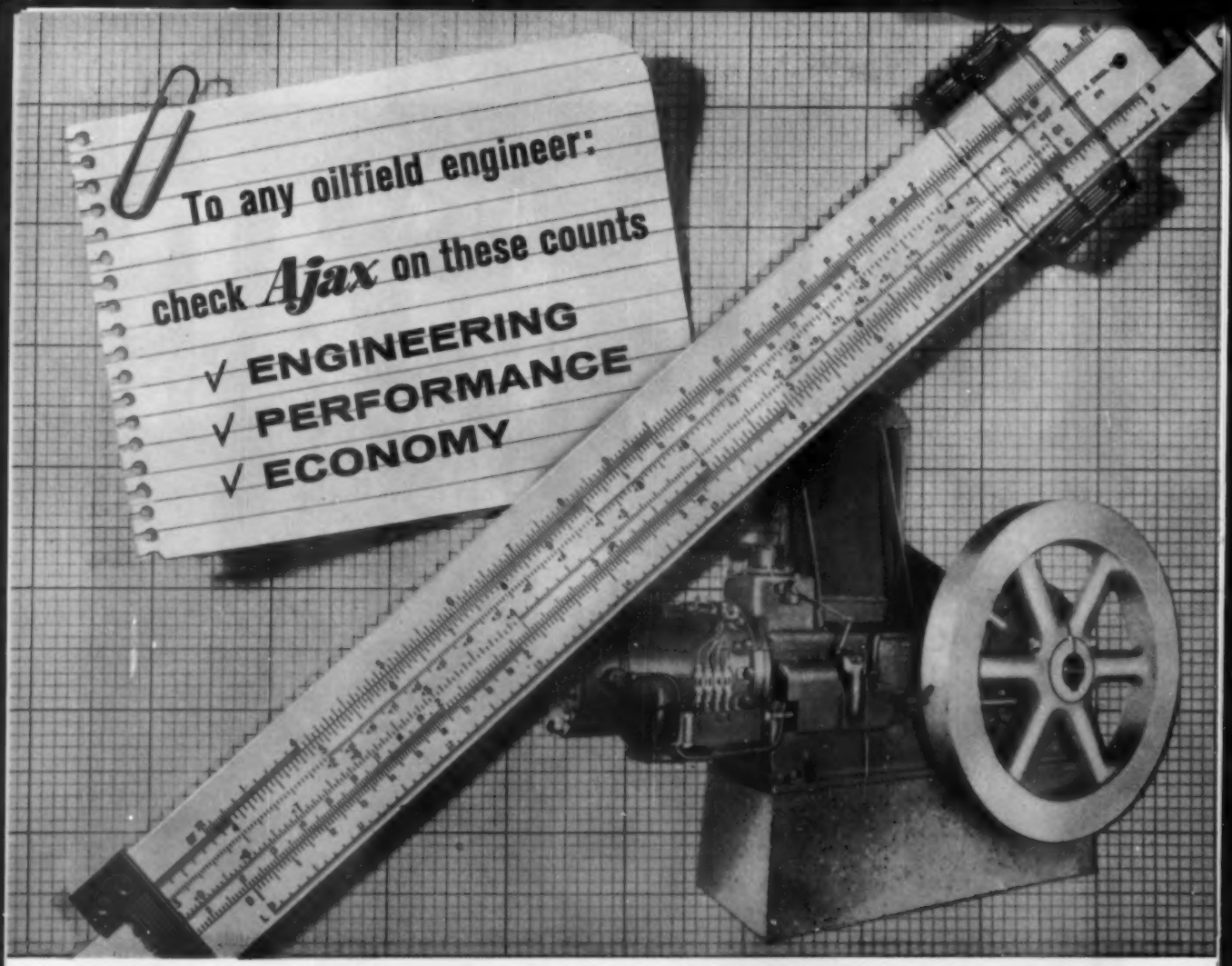
high tensile strength virtually eliminates breakage in the field.

L·O·F GLASS FIBERS

For full details on complete pipeline protection, write to: *Dept. 78-98, 1810 Madison Ave.*

**L·O·F GLASS FIBERS COMPANY**

TOLEDO 1, OHIO




## ...and discover that the soundest gas engine concept is the simplest and most efficient in practical results

The 2-cycle gas engine, an integral part of oil production since the very beginning, is as *new as today* when it bears the AJAX nameplate. In the past decade the Ajax program of continuous, creative engineering development has brought the 2-cycle engine fully into its own—delivering greatly increased horsepower for the same bulk—economy far outrunning any other type of prime mover—continuous, unsupervised operation for months on end if need be—and *maintenance as low as Ajax life is long.*

● For the rugged jobs, the 2-cycle engine gets the call. For top quality performance, call on Ajax! Your Supply Man will be glad to oblige.

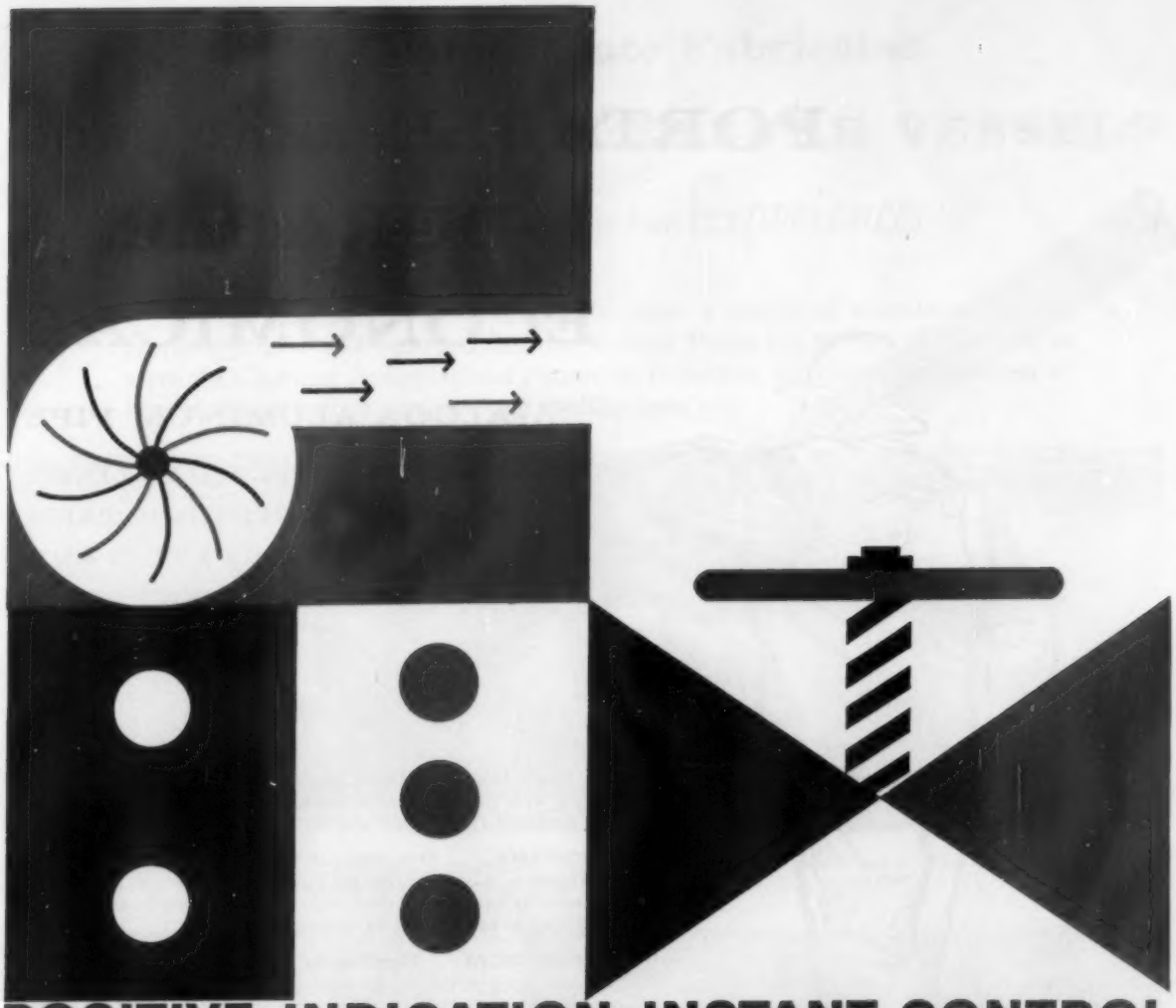
GAS ENGINES AJAX SINCE 1877

**Ajax IRON WORKS**

*Builders of* GAS AND OIL ENGINES · PRESSURE PUMPS

**CORRY, PENNSYLVANIA**

*Oil Field Distributors:* THE NATIONAL SUPPLY CO., PITTSBURGH, PA. • R. B. MOORE SUPPLY CO., BOLIVAR, N. Y. • BETHLEHEM SUPPLY CO., TULSA, OKLAHOMA



# POSITIVE INDICATION-INSTANT CONTROL OF REMOTE PUMP MOTORS AND VALVES

S&J Gardtrol units continuously report actual conditions at remote points. They also allow instant change of conditions by the operator. Gardtrol Valve Monitor shows open, opening, closing, closed or stopped (partly closed) conditions. Gardtrol Pump Motor Monitor indicates on or off. Both have simple illuminated push button controls for all functions. Only one small wire—plus a common return—is needed between control unit and the field unit. S&J Gardtrol assures reliable supervisory control at lowest cost.

**SHAND AND JURS**

SHAND AND JURS COMPANY 2600 Eighth Street, Berkeley, California

**A Subsidiary of General Precision Equipment Corporation**

**Branch offices and representatives in principal cities**

# PORTABLE, DURABLE, ECONOMICAL

## ...ALCOA ALUMINUM PIPE

### FOR WATER SUPPLY, GAS LINES, GATHERING SYSTEMS, TANK BATTERY LINES AND VENT LINES

If you're looking for portable piping that combines low installed cost with excellent performance, specify light, strong ALCOA® Aluminum Pipe. Here's why:

**PORTABLE** . . . One man can easily handle several standard lengths of ALCOA Aluminum Pipe. Small crews can quickly and easily lay long lines of pipe. Pick-up and relaying is easily accomplished to keep pace with moving jobs.

**ECONOMICAL** . . . Handling by small crews means low laying costs. Long service life adds extra savings.

**DURABLE** . . . Rugged ALCOA Aluminum Pipe stands up well under heavy abuse. And it's highly resistant to corrosion under the most severe conditions.

Operating efficiency of ALCOA Aluminum Pipe is excellent . . . same friction factor as smooth drawn tube of other metals insures low loss of head.

**AVAILABLE** . . . ALCOA Aluminum Pipe and quick couplings of aluminum are immediately available through a nationwide network of distributors. You will find them listed under "Pipe" in the Yellow Pages of your telephone directory. Check your nearest distributor for detailed specification data. Or mail the convenient coupon.

Aluminum Company of America
921-J Alcoa Building, Pittsburgh 19, Pennsylvania

Please send me your free booklet describing portable piping of Alcoa Aluminum.
I need low cost, portable piping for the following services:

_____

_____

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

ALCOA ALUMINUM

ALCOA THEATRE
Fine Entertainment
Alternate Monday Evenings

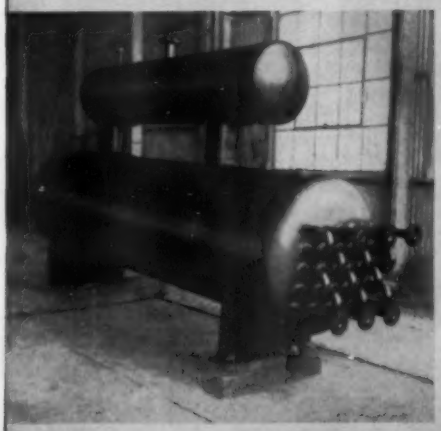
# For Custom Plate Fabricated

# CODE TANKS and PRESSURE VESSELS

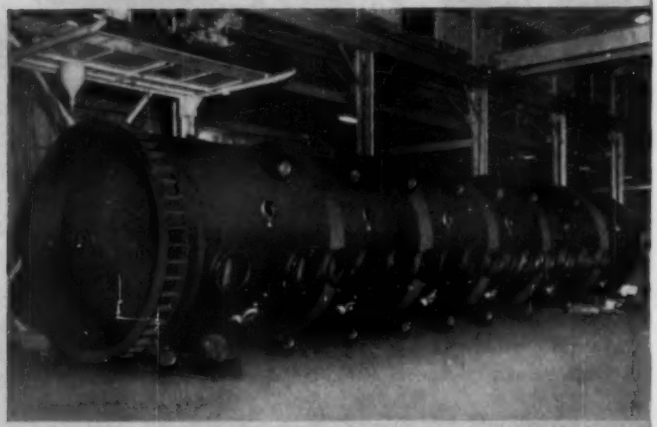
## there is no substitute for *Experience*

*Modern Welding* Company offers a wealth of experience in plate fabrication. Five well equipped Modern Welding Plants are strategically located to serve the Chemical Processing and Petroleum Industries. All plants are equipped to handle vessels that require exacting specifications.

**Fractionating Column**—72" Dia. X 110'-0" length, ¾" wall thickness with 40 trays. All welds 100% X-ray quality. Constructed for internal pressure and full vacuum. Stamped A.S.M.E. Code. Total weight 83,000 lbs.



**Heat Exchanger** — Lower Section 4'-0" dia. X 14'-0". Upper Section 1'-8" dia. X 10'-0", ⅝" Carbon Steel Plate Wall. A.S.M.E. Code construction using tube bundle of schedule 160 pipe.



**Styrene Stripping Column**—9'-6" Dia. X 80'-0" length, ½" plate walls and ⅝" heads. Constructed and stamped A.S.M.E. Code. Vessel contains 14 stainless steel perforated trays, 16 manways, 146 couplings, and nozzles. Total weight 72,000 lbs.

MODERN TANKS QUALITY

## MODERN WELDING COMPANY

INCORPORATED

**Owensboro, Kentucky**

NEWARK, OHIO · ORLANDO, FLA. · HOUSTON, TEXAS · BURLINGTON, IOWA

# GAS ENGINES DO IT AGAIN!

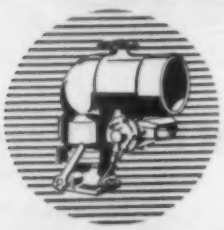
## *Worlds' Deepest Well*

TRIPLE
**Le Roi V12 L-4000'S**
with **ENSIGN** CARBURETION

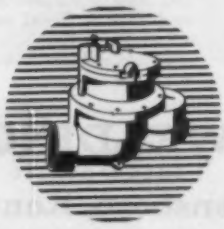
Monstrous power of these triple LeRoi gas engines pushed the Phillips well 1-EE University, Pecos County, Texas, past the 24,000 foot mark, deepest hole in the world.

THIS IS GAS ENGINE POWER. Its unfailing dependability is, of course, taken for granted because good engine designers intended it that way. Likewise, dependable and unfailing as the gas engine carburetion must be, it, too, is taken for granted because carburetor designers at Ensign intended it that way. And so it is today for nearly half a century Ensign carburetion is OEM (original equipment) on practically all leading makes of Gas and LP-Gas power units. Ensign is dependable.

INSIST ON ENSIGN — ACCEPT NOTHING LESS!



*Ensign 3" Model Dg Gas Carburetor*



*Ensign 2" Model B Fuel Regulator*

**ENSIGN**
**CARBURETOR COMPANY**
1551 E. Orangethorpe, Fullerton, California
Branch Factory: 2330 W. 58th Street, Chicago, Illinois
Dealers and distributors in all principal cities

U-510 on salt-water disposal near Sulphur Bluff, Texas.

## *So many uses for*

# BETHLEHEM DUPLEX GENERAL-SERVICE PUMPS

Bethlehem's U-series pumps are unusually rugged duplex units with a very wide range of general-service application.

No matter which model satisfies your requirements, you will get a pump designed for heavy service. All power ends are built to withstand continuous operation at full load. Positive lubrication is achieved by a fool-proof gravity-flow system. Fluid ends of alloy iron, steel, or aluminum-bronze are available with proper trim to insure maximum durability.

Ask our nearest office or store for complete details.

### *Major applications of Bethlehem Duplex Pumps:*

| | |
|---|---|
| Crude-oil gathering | Pumping refined products |
| Salt-water disposal | Handling LPG |
| Secondary recovery | Lean-oil service |
| Pumping natural gasoline | Mud-mixing |
| Rig water supply | |

### *A size for every job:*

| Model | Type | Piston Rod Load, lb | Input hp | Bore and Stroke, in. |
|---|---|---|---|---|
| U-33 | Duplex | 2400 | 11 @ 140 rpm | 1 ¾ to 3 x 3 |
| UA-46 | " | 5000 | 40 @ 120 " | 2 ½ to 4 x 6 |
| U-510 | " | 12000 | 100 @ 75 " | 3 to 5 ½ x 10 |

### *Also available — Bethlehem triplex models:*

| Model | Type | Plunger Load, lb | Input hp | Bore and Stroke, in. |
|---|---|---|---|---|
| TP-3 | Triplex | 3580 | 22 @ 250 rpm* | 1 ¼ to 2 ¼ x 3 |
| TP-4 | " | 5500 | 46 @ 250 " * | 2 to 4 x 4 |
| TP-6 | " | 10000 | 100 @ 200 " * | 2 to 4 ½ x 6 |

*For higher ratings, refer to General Offices, Tulsa, Okla.

BETHLEHEM SUPPLY COMPANY

*General Offices:* 21 E. Second St., Tulsa, Okla.

*West Coast Headquarters:* Los Angeles, Calif.

*Canadian Distributor:* Bethlehem Supply Company of Canada, Ltd. Calgary, Alberta, Canada

*Export Office:* Bethlehem Supply Company (Export Division) 25 Broadway, New York, N. Y.

**BETHLEHEM SUPPLY**

BETHLEHEM STEEL

# This is Why the Nash is the Most Simple Compressor

## *It's the Nash!*

There are no mechanical complications in a Nash Compressor. A single moving element, a round rotor, with shrouded blades, forming a series of buckets, revolves freely in an elliptical casing containing any low viscosity liquid. This liquid, carried with the rotor, follows the elliptical contour of the casing.

The moving liquid therefore recedes from the rotor buckets at the wide part of the ellipse, permitting the buckets to fill with gas from the stationary Inlet Ports. As the casing narrows, the liquid is forced back into the rotor buckets, compressing the gas, and delivering it through the fixed Outlet Ports.

Nash Compressors produce 75 lbs pressure in a single stage, with capacities to 6 million cu. ft. per day in a single structure. Since compression is secured by an entirely different principle, gas pumping problems difficult with ordinary pumps are often handled easily in a Nash.

Nash simplicity means low maintenance cost, with original pump performance constant over long periods Data on these pumps sent immediately on request

- No internal wearing parts.
- No valves, pistons, or vanes.
- No internal lubrication.
- Low maintenance cost.
- Saves floor space.
- Desired delivery temperature automatically maintained.
- Slugs of liquid entering pump will do no harm.
- 75 pounds in a single stage.

**NASH ENGINEERING COMPANY**
**313 WILSON, SO. NORWALK, CONN.**

# 7 Specific Features Make Bucyrus-Eries The Only Real Pipeliner's Specials

1. HI-WALKER, (over 20 inch clearance on the ¾-yd. 22-B), keeps you moving over rough country. That's because Bucyrus-Erie 15-B and 22-B are offered with tractor-type crawlers.

2. DEEP GROUSERS take hold where the ground is soft, or when you run into slippery rock.

3. SEALED BEARINGS keep sand and dirt out of track roller axles . . . cut maintenance.

4. FLOTATION is exceptional, takes you through swampy ground.

5. POWER is delivered through a smooth power train to the front-end attachment, giving you steady pulling through hardpan, rocky ground.

6. JOB-PROVED CONSTRUCTION throughout takes Bucyrus-Erie out of the "expendable" machine class. You make money with them job after job.

7. LONG, CAMBERED HOE BOOMS let your operators dig deep, dump at wide reaches. Bucyrus-Eries work just as well with clamshell, crane or dragline attachments — all easy to interchange on the spread.

BUCYRUS-ERIE *means* dependability because Bucyrus-Erie hoes are made for your jobs — to *work* your kind of *work*. Pipeline specials are available in ½-yd. and ¾-yd. sizes — see your nearby Bucyrus-Erie distributor today. Bucyrus-Erie Company, South Milwaukee, Wisconsin.

532E58

*A Familiar Sign...* BUCYRUS ERIE *..at Scenes of Progress*

# 40% MORE 40% 40% WATER

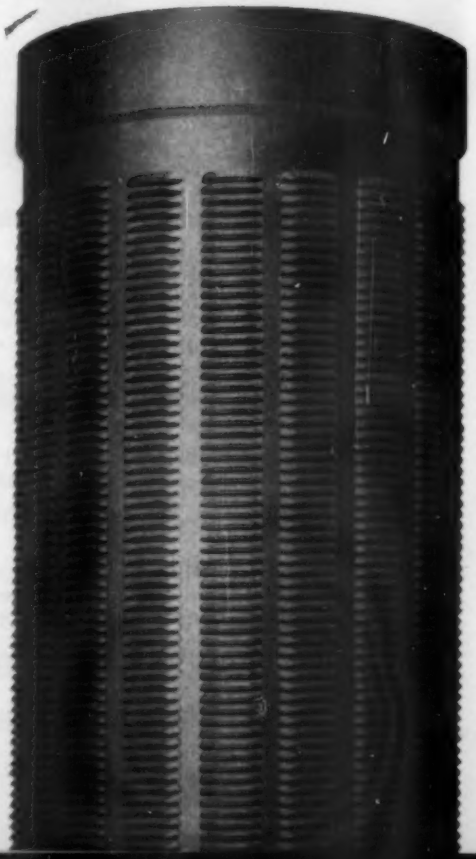
## can flow through the NEW Layne 134 shutter screen

**WHY?** *Increased inlet area!*

Here's a screen that is even more efficient . . . has *greater strength* than the long-lasting Layne 96 shutter screen that made Layne water wells famous.

This new development of Layne creative research is used only in Layne water well installations, and available exclusively through Layne Associate Companies.

*Contact your nearest Layne Associate Company for complete details.*



Layne

**LAYNE & BOWLER, INC. MEMPHIS**
General Offices and Factory
Memphis 8, Tenn.

Layne Associate Companies throughout the world.

**WATER WELLS**
**VERTICAL TURBINE PUMPS • WATER TREATMENT**

# They Say--

## Constructive imports editorial

Dear Sir:

Your editorial ("Now We Can Put Sense in Imports Limitation") on page 39 of the August 25 issue of the Journal is very constructive.

I believe, under the present Trade Agreements law, the industry has an opportunity of finding a workable remedy to an old and distracting problem. I hope we will not fail to recognize this opportunity. I appreciate your encouragement.

Russell B. Brown
General Counsel
Independent Petroleum
Association of America
Washington.

## Grass-roots public relations

Dear Sir:

The recent change in public-relation policies within the API, as announced in the August 25 issue (p. 41), interests me greatly as I have felt for years that our public relations were not getting down to "grass roots."

Perhaps, outside of furnishing solid information for legislative bodies, little more can be done. To me, it seems futile to spend millions of dollars to reach the general public as the oil business will be subject to attack for many years to come.

As I see it, all that the industry can do is:

1. Continue giving the fine sales service for which it is noted.
2. Continue to furnish vital information to legislative bodies.
3. Meet attacks promptly with specific information about the true situation (then let the case rest).
4. Drop expensive general publicity that "goes in one ear and out the other."
5. As a corollary, use publicity selectively to meet specific local and national situations.

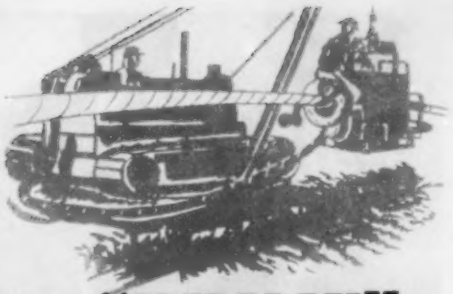
Dorsey Hager
Consulting Geologist
Salt Lake City.

## Difficult subject is readable

Dear Sir:

In the August 18 issue of The Oil and Gas Journal there appeared an article entitled "Herscher Dome: Storage Despite Leak" (p. 114).

Like most of your readers, we are quick to point out an error which con-

ONLY THOSE JUDGED "PRIME"
ARE CORRALLED AT MIDWESTERN

Industry leadership is the first requisite for products distributed by Midwestern.

For over 12 years Midwestern has successfully championed scientific pipe protection by supplying customers with the ultimate in pipe wrapping materials.

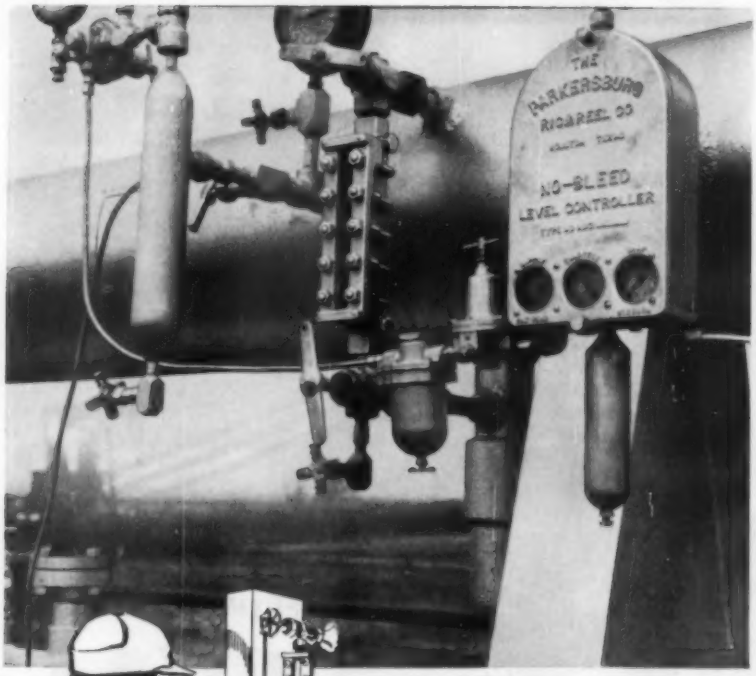
Longer life, stronger reinforced coatings, increased speed and ease of application are blue ribbon features of the Midwestern line.

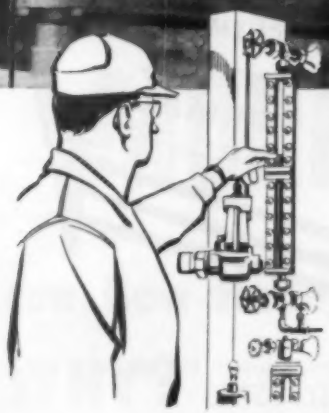
Whether your pipe wrap needs are above or below ground, one or a combination of these superior Midwestern products can satisfy even the most critical demand—"GLASFAB" AND GLASKOTE Handwraps... KAPCO Rock Shield... KERMAC Outerwrap . . . KEYSTONE Keybestos Felt . . . COROMAT Underground Wrap . . . PITT CHEM Tar Base Coatings.

For quick and expert service—
Call the Midwestern man nearest you.

MIDWESTERN
PIPE LINE PRODUCTS CO.
4645 Southwest Blvd. Tulsa, Okla. HI 6-6144
Cable Address: Mid Pipe

Branch offices—
• Houston, Tex.
• Atlanta, Ga.
• Mt. Prospect, Ill.
• Pittsburgh, Pa.
• Oklahoma City, Okla.
• New York, N.Y. (export)
• Caracas, Venezuela



"PENBERTHY gages are preferred as accessories by the men who specify and use Parkersburg pressure vessels. They are established as a quality product in the minds of most of our customers. That's good enough for us!"

**Outside View of the Inside Story**

# PENBERTHY GAGES

In addition to assuring *accurate* liquid level readings, Penberthy gages today provide exact determination of color, density, and action in the heart of many processes.

With UNOBSTRUCTED VISIBILITY at temperatures from sub-zero to over 750° F.... at pressures exceeding 10,000 psi... Penberthy gages assure more accurate process control — increase protection to vital installations.

Used extensively for fluids ranging from water to highly corrosive chemicals, Penberthy gages are available in bronze, iron, carbon steel, stainless steel, monel, etc.... from stock or designed to specification.

Exclusive Penberthy features simplify maintenance... assure stressless seating and alignment of glass... permit servicing without removal of assembly from vessel. Request on your letterhead will bring you a copy of Catalog 36 showing complete line.

**PENBERTHY MANUFACTURING COMPANY**
*Division of Buffalo-Eclipse Corporation*
**1242 Holden Avenue  Dept. J  Detroit 2, Michigan**

*Everywhere...you're seeing more*
**PRODUCTS BY** PENBERTHY

- EJECTORS
- INJECTORS
- CYCLING JET PUMPS
- LIQUID LEVEL GAGES
- GAGE VALVES
- SUMP PUMPS

cerns us or an approach of which we disapprove. Also, we are probably like most of these same readers who neglect too often to speak a word of praise when it is due, taking a good job for granted.

Our executive vice president, M. V. Burlingame, was extremely pleased with the presentation. O. C. Davis, our general superintendent of storage, commends it as one of the best he has seen on this subject.

For what it is worth, I concur that this is a comprehensive and highly readable presentation on a difficult subject. Please convey to the writer of this article our warm congratulations for a job well done.

R. H. Lewis
Director Public Relations
Natural Gas Pipeline Co. of America
Chicago.

## Let's emphasize training

Dear Sir:

The Oil and Gas Journal of June 24, 1957, published an article entitled, "How to Find and Keep Oil Explorers" (p. 102).

You did such an excellent job of presenting the story that I see no particular way in which it could be improved except to bring the information up-to-date with specific reference to the names of oil companies that have most recently cooperated and with reference to recent statistics concerning the number of colleges and universities that have been involved, the number of participants who have gone into some phase of the petroleum industry, etc.

I feel that all of us should continue to publicize worthy educational efforts that are being made to produce the kinds of scientists and engineers that will be needed by the petroleum industry in the future.

Robert R. Shrock
Chairman
Department of Geology and Geophysics, Massachusetts Institute of Technology
Cambridge.

## Yachtsmen fight low bridges

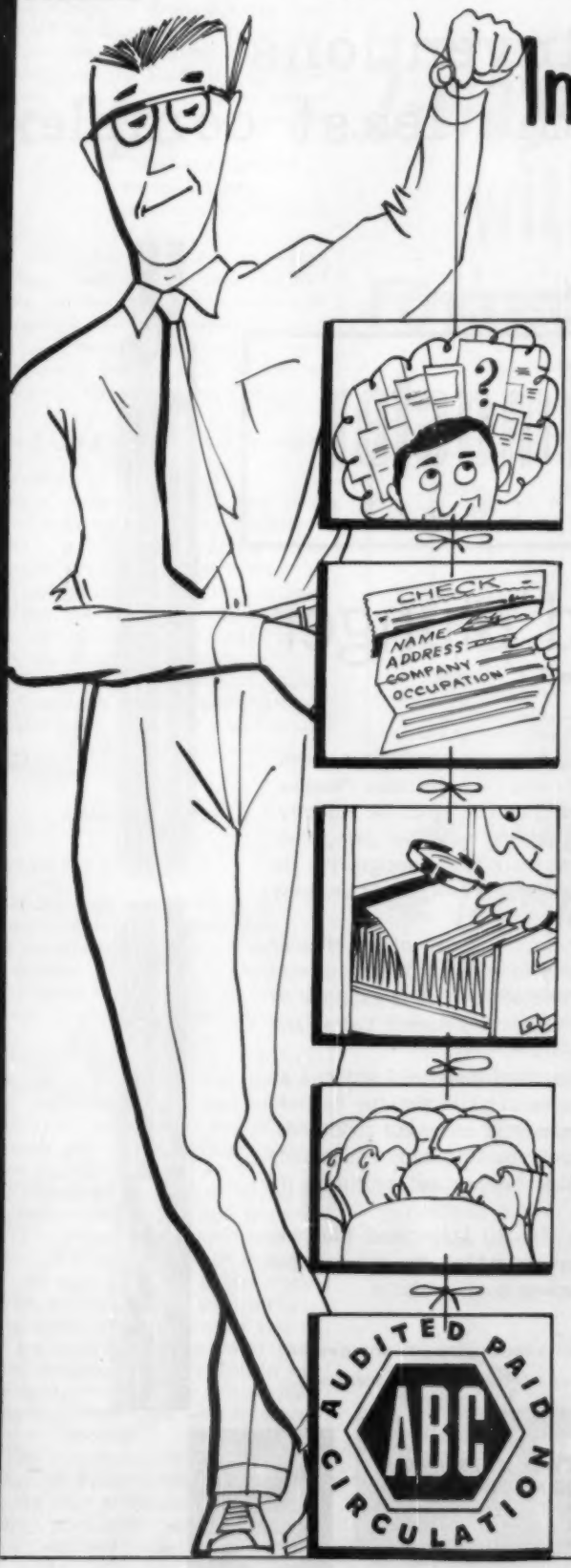
Dear Sir:

Your article, "Low Bridges = Low Blow," which appeared in your July 14 issue (p. 81), has been brought to my attention and it is indeed gratifying and most encouraging to find a great industry behind the yatchsmen of the United States who are opposed to lowering the minimum height of fixed bridges over the waterways of the United States.

In that connection, I enclose a copy

OIL and GAS JOURNAL

# Imagination has its place...




BUT—you, as a reader of The Oil and Gas Journal, won't get your money's worth out of the Big Yellow Book if our editors just sit here and "imagine" what you want to read.
AND—you, as an advertiser in The Oil and Gas Journal, don't want to spend money telling an "imagined" audience how your products and services can help them.

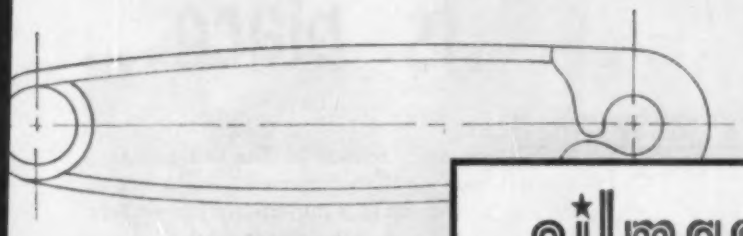
So , to be sure we know our readers and their needs, the Journal requires everyone to identify himself through a subscription form. Too, every subscription must be paid for. This serves as a tool to measure—through continued renewals—our efforts to serve our readers, because no one will continue to pay for something unless it fits his needs and interests.

Then, to be sure of a factual, impartial study of Journal readers, we maintain membership in the Audit Bureau of Circulations, an independent, non-profit association.
Each year, the Bureau sends an auditor to our office. He checks our records and issues a detailed report showing who each subscriber is, what his job is, proof of payment, and whether his subscription is new or a renewal.

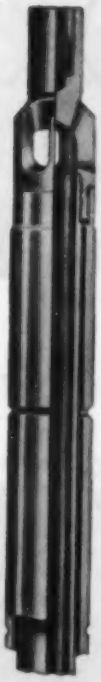
Our editors study this report to keep up to date on the readers whom they serve. Advertisers have access to this report to determine that their product and service information reaches the people who are interested. There's nothing left to the "imagination" when ABC checks a magazine.

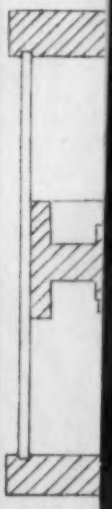
Membership in the Bureau assures both reader and advertiser of the editorial integrity of a publication. We are proud to carry the Bureau's symbol on our masthead.

# the most useful mechanical inventions are often the least complex



*another* ..... oilmaster EXCLUSIVE





## oil lubricated plunger

One of the few completely new developments in down-well pumping equipment today—the Oil Lubricated Plunger, has created quite a stir in production circles of the industry. Using a combination of very simple hydraulic principles, coupled with the most practical mechanical design, the Oil Lubricated Plunger actually establishes a new set of standards for plunger performance.

The unique principle employs the use of an annular chamber within the plunger body to separate clean oil from sand and water. A continuous film of clean oil is supplied by pump action to lubricate the close fit between barrel and plunger.

Problems of abrasion have been materially reduced as a result of this design. Actual field tests continue to yield evidence of superior performance in all water cut conditions. Testimonials from operators bear out the wide acceptance of this unique principle as an important engineering achievement.

The range of usage for the Oil Lubricated Plungers seems virtually unlimited. In casing, tubing and insert installations its performance has proven commendable.

**Ask your OILMASTER representative to demonstrate the advantages of the Oil Lubricated Plunger. Write Box 64, Los Nietos, Calif. for literature.**

**FLUID PACKED PUMP CO.**
*Main Office and Plant, Los Nietos, Calif.*
Distributed by the National Supply Co., Pittsburgh, Pa.
Export: The National Supply Co., Export Division, 600 Fifth Ave., New York
Co-Distributors: Union Supply Store, Beacon Supply Co., Industrial Supply Co.

oilmaster PUMPS

of a statement which I made to the Army Corps of Engineers on April 8, 1958, at a hearing before them in Jacksonville, Fla., in my capacity as president of the Yacht Racing Association of Long Island Sound and as representative of the North American Yacht Racing Union.

W. Mahlon Dickerson
Satterlee, Browne,
Cherbonnier & Dickerson
New York.

*Editor's note: The Journal's sympathy is with the operators of offshore drilling rigs, who need high bridges for normal movement of their rigs and to reach port quickly when hurricanes threaten. If yachtsmen benefit at the same time, fine.*

## The 4-cent stamp vs. 1½ cents

Dear Sir:

Your figures on postal rates were very interesting ("Journally Speaking," Sept. 1, p. 97). What gets me is the constant stream of advertisements of loan companies and insurance companies sent for 1½ cents. These letters take all the handling a 4-cent letter does and should pay 4 cents.

Why should the U. S. Government subsidize loan and insurance companies by giving them cut rates on advertising? If they paid more you might have to pay less.

C. L. Thomas
Oklahoma City.

## Engineers on strike

"It has long been obvious that if engineers want unions they must accept the consequences. It is foolhardy to pretend that the concepts of professionalism can survive or flourish in an atmosphere of collective bargaining.

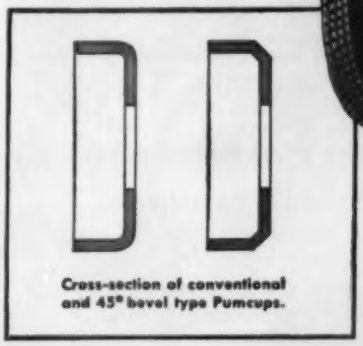
"This latest strike (at RCA's Camden, N. J., research and development department) is nothing new in proof of our comment. It was, in fact, the sixth strike by an engineers' union in the past five years. . .

"Professional status must be based on public understanding and recognition for professional contribution to society. It is rather futile to look for this response from the public while walking a picket line a la trade unions.

"It should be noted in this regard that the engineers' union based part of its argument for a settlement on its proposed terms on the ground that essential defense work was being delayed by the strike. . .

"The firm belief of the National Society of Professional Engineers is that the only professional method of solving grievances between professional engineer and employer is


2-way gain with PUMCUPS



Cross-section of conventional and 45° bevel type Pumcups.

*Darcova Pumcups are available in various types and textures, in a complete range of sizes, to provide unequalled efficiency and long life in reciprocating pumps, air or hydraulic mechanisms.*

★ *prolonged high efficiency*
★ *less maintenance*

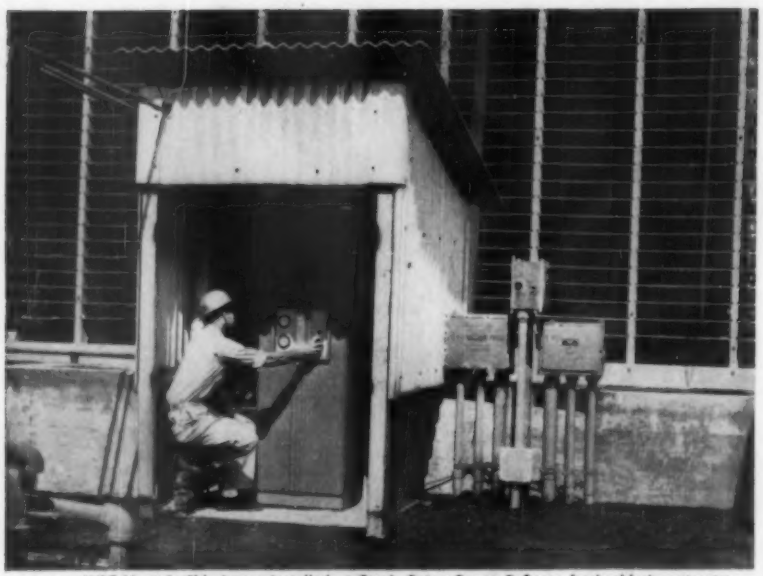
TODAY hundreds of companies using hydraulic controls, air cylinders or reciprocating pumps are *standardizing* on Darcova Pumcups for piston packing, because they eliminate fluid slippage, costly down-time and maintenance.

Darcova Pumcups make the *most* of the cup packing principle. And, they are made in a complete range of sizes, types and texture-engineered compositions for various pressure-temperature-fluid conditions. Pumcups hold peak efficiency for the life of the cups and outlast other packing as much as 3 to 1.

Why not check these claims right in your own plant? Meanwhile get *all* the facts. Just send for Pumcup Bulletin No. 5503.

**DARLING VALVE & MANUFACTURING CO.**
Williamsport 1, Pa.

DARCOVA
THE ORIGINAL COMPOSITION CUP
TRADE MARK
PUMCUPS



W&T V-notch Chlorinator installed at Esso's Baton Rouge Refinery feeds chlorine at rates up to 500 lbs./24 hr. Units are available with chlorine capacities up to 2000 lbs./24 hr.

**NEW W&T V-NOTCH CHLORINATORS,**

*used at Oil Refineries, are rugged, easy to operate and moderately priced.*

Esso Standard Oil Co. has a W&T V-notch Chlorinator installed at their Baton Rouge, La., Refinery. The chlorinator, installed in a small shed open to the sun and weather, chlorinates cooling water for slime control.

This type of installation would be considered rugged service for other equipment but V-notch Chlorinators are designed for such use. They are made of materials that are completely resistant to corrosion as well as weather. They are simple to operate and to maintain. In addition, W&T V-notch Chlorinators are an attractive piece of equipment, colored green to fit into industrial color schemes.

For more information about W&T V-notch Chlorinators, send for bulletin CD-44.66.

WALLACE & TIERNAN INCORPORATED

25 MAIN STREET, BELLEVILLE 9, NEW JERSEY

E. R. P. CATHODIC PROTECTION
...INDIVIDUALLY DESIGNED FOR EACH APPLICATION

to prevent corrosion of buried or submerged metal structures

*Write for Bulletin E-37*

E-37

ELECTRO RUST-PROOFING CORPORATION

30 MAIN STREET, BELLEVILLE 9, N. J.

through the development of effective communications between the engineers and management."

*Clark A. Dunn, president, National Society of Professional Engineers, in a statement to the press.*

## Geology and public relations

"The neglected role of the petroleum geologist . . . is that of public relations. By this, I mean the role that we as geologists should be taking in promoting, first, the interests and welfare of the industry which employs us, and second, our own professional status as geologists working in that industry . . .

"I regret to say I know of many opportunities which geologists have had to do a good public-relations job for the industry which were missed because they did not know a few basic facts about our own industry or were reluctant to express themselves . . .

"(We should) assume our proper role in public relations, and we should volunteer our services freely and graciously on behalf of the industry and our own profession."

*P. W. Fairchild, area geologist, Shell Oil Co., Denver, in a speech before a meeting of the Rocky Mountain Association of Geologists.*

**Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.**

# CALENDAR

**SEPTEMBER**

**18** Natural Gasoline Association of America, Rocky Mountain regional meeting, Gladstone Hotel, Casper, Wyo.

**18-20** Rocky Mountain Association of Geologists, field trip, Maroon basin, registration, Glenwood Springs, Colo.

**21-24** American Society of Mechanical Engineers, petroleum division, mechanical engineering conference, Cosmopolitan Hotel, Denver.

**22** University of Texas, third semiannual school of gas technology, 6-week term, Conroe, Tex.

**22-24** American Institute of Chemical Engineers, national meeting, Hotel Utah, Salt Lake City.

**24-25** Western Petroleum Refiners Association, Rocky Mountain regional technical-industrial relations meeting, Henning Hotel, Casper, Wyo.

**24-25** National Association of Corrosion Engineers, San Joaquin Valley section, corrosion tour, Bakersfield, Calif.

**25** Manufacturing Chemists' Association, Texas Chemical Council, chemical industry safety workshop, Shamrock Hilton Hotel, Houston.

**25-26** Mid-Continent Oil and Gas Association, Louisiana-Arkansas division, annual meeting, Roosevelt Hotel, New Orleans.

**25-27** Illinois State Geological Survey, bien-

# CP ROCK BITS

*in gauge at all times*

Chicago Pneumatic

FORT WORTH, TEXAS

TOOL JOINTS

THREE CONE BITS

REAMERS

*Distributed World-Wide by*

**CP-HARRISBURG, INC.**

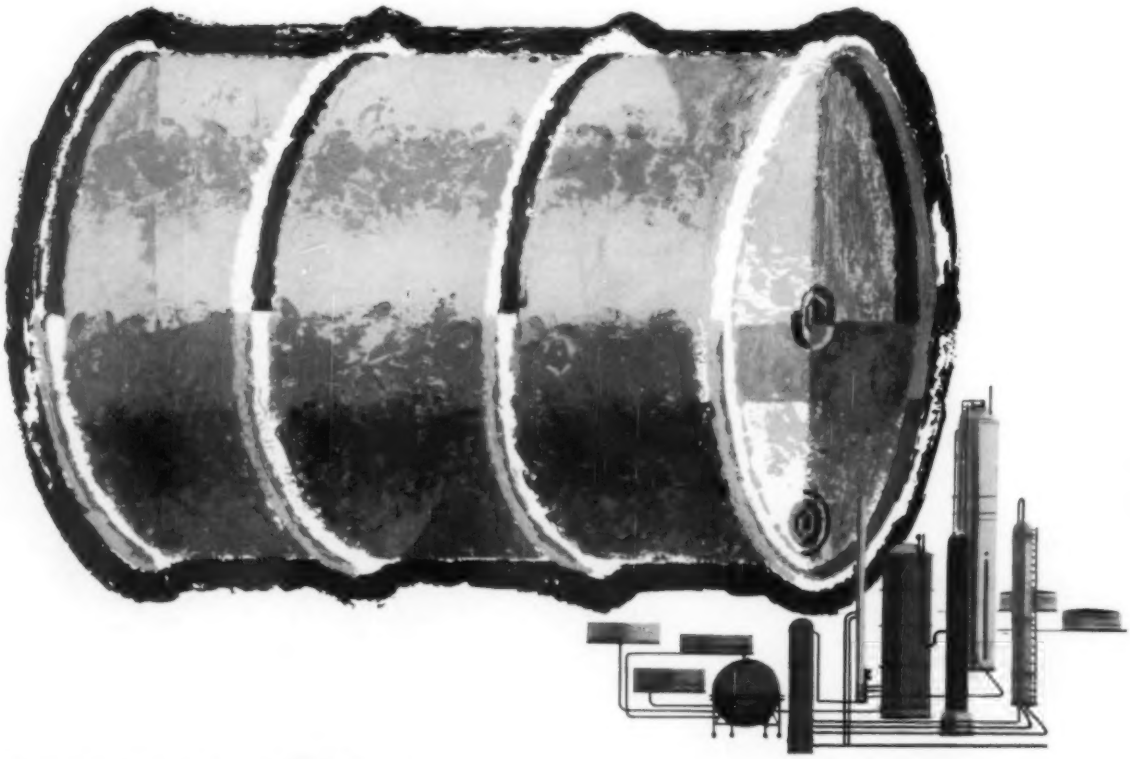
FORT WORTH, TEXAS

*Through Authorized Supply Companies*

DRILL COLLARS

REAMING BITS

call KE for plant expansion or new facilities



**INGENUITY** has made KE a leader in refineries and petrochemical plants. For Shell Oil—a multi-million dollar platinum catalyst reformer. For American Gilsonite—coke calcining and off-site facilities. For Texas City Refining—a moving bed catalytic cracker. These are typical of the demanding assignments that Ingenuity brings to Kaiser Engineers. KE can take your refinery project from initial concept through completion. Economic analysis, site selection, process and mechanical design, procurement, expediting, construction, start up—KE does one or all. Throughout, KE ingenuity works to shorten construction time, reduce costs and produce a more efficient, dependable facility. Your next plant or addition can benefit this way—from ingenuity in action. Call KE.

Ingenuity in Action. New multi-million dollar platformer for Shell Oil Company, Wilmington, California. Design and construction by Kaiser Engineers.

KAISER ENGINEERS

**KAISER ENGINEERS** engineers-contractors
Contracting since 1914

Division of Henry J. Kaiser Company · Oakland 12, California · New York, Pittsburgh, Washington, D. C.
Buenos Aires, Calcutta, Dusseldorf, Montreal, Rio de Janeiro, Sydney, Tokyo

nial petroleum engineering conference, University of Illinois, Urbana.

29-Oct. 3 Society of Automotive Engineers, national aeronautic meeting, aeronautic production forum, and aircraft engineering display, The Ambassador, Los Angeles.

**OCTOBER**

1-2 Western Petroleum Refiners Association, third annual stream-pollution and waste-disposal conference, Lassen Hotel, Wichita.

1-3 American Association of Oilwell Drilling Contractors, eighteenth annual meeting, Adolphus and Baker Hotels, Dallas.

3 American Institute of Chemical Engineers, South Texas section, thirteenth annual technical meeting, Moody Center, Galveston, Tex.

5-8 Society of Petroleum Engineers of AIME, fall meeting, Houston.

5-8 National Association of Corrosion Engineers, northeast region, Somerset Hotel, Boston.

5-9 American Society for Testing Materials, D-2 committee on petroleum products and lubricants, Mayflower Hotel, Washington.

7-8 Texas Mid-Continent Oil and Gas Association, annual meeting, Statler-Hilton Hotel, Dallas.

9-10 California Natural Gasoline Association, thirty-third annual fall meeting, Huntington - Sheraton Hotel, Pasadena, Calif.

10-12 Tri-State Oil Show, Roberts Municipal Stadium, Evansville, Ind.

12-18 OIL PROGRESS WEEK.

13-15 American Gas Association, annual convention, Atlantic City, N. J.

13-15 American Society of Mechanical Engineers, American Society of Lubricating Engineers, conference on lubrication, Statler Hotel, Los Angeles.

13-16 Society of Exploration Geophysicists, annual meeting, Hotel Gunter, San Antonio, Tex.

13-17 American Society of Civil Engineers, annual convention, Hotel Statler, New York.

15-16 South Dakota Independent Oil Men's Association, convention, Sheraton-Johnson Hotel, Rapid City.

15-16 University of Kansas, Southwest Kansas Center, sixth annual Gas Measurements Institute, Liberal, Kans.

15-17 National Association of Corrosion Engineers, north central region, Cincinnati.

15-17 Petroleum Conference on Well-Logging Interpretations, third annual conference, McMurry College, Abilene, Tex.

16-17 Society of Petroleum Engineers of AIME, Southern California petroleum section, Biltmore Hotel, Los Angeles.

16-18 New Mexico Geological Society, Arizona Geological Society, ninth annual field conference, Black Mesa basin, registration Gallup, N. M., Oct. 15.

16-19 Permian Basin Oil Show, Odessa.

19-21 National Association of Oil Equipment Jobbers, annual convention and trade show, Hotel Adolphus, Dallas.

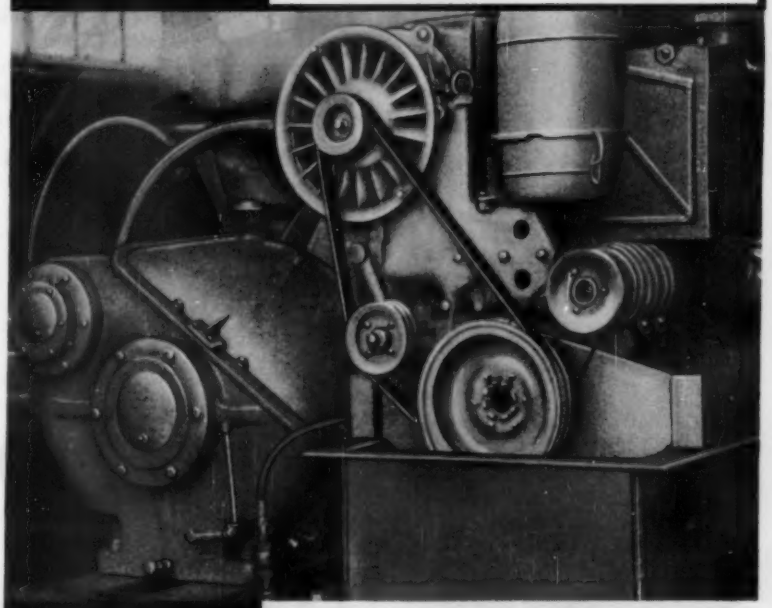
20-21 Instrument Society of America, national rubber and plastics instrumentation symposium, Akron, Ohio.

20-24 National Association of Corrosion Engineers, south central region, Roosevelt Hotel, New Orleans.

20-24 National Safety Council, forty-sixth


AIRCOOLED DEUTZ DIESEL

operates on crude oil in Oklahoma pumping station



*Fuel cost:* $.0887 per hour to pump 110 barrels an hour over 20-mile pipe line

Deutz Aircooled Diesel powers Gaso Pump operating at 465 psi and 73 spm. Mid-Continent Pipe Line Co. operation described below, uses only half the h.p. rating of this Deutz Diesel — (Model A4L-514. Cont. BHP 50. Normal RPM, 1500. Displacement 324.6 cu. in. Weight 1211 lbs.)

Deutz Aircooled Diesels range from 7-200 BHP and are available in 1, 2, 3, 4, 6, and V8 and V12 cylinder models, water cooled engines up to 2,000 BHP. They have found hundreds of useful applications in the pipeline industry.

Burning crude, Deutz Aircooled Diesel cuts usual fuel costs by more than half.*

This was the result achieved in 1,000 hours of operation by the Mid-Continent Pipe Line Company at its Key West Station, Stroud, Oklahoma.

At this Mid-Continent station, 110 barrels of 40° gravity crude oil an hour are pumped through a 20-mile line to a larger gathering system at Bristow, Oklahoma. To do the job, this aircooled Deutz Diesel required just .034 barrels of crude (40° gravity) an hour!

| *FUEL OR POWER COST PER BHP | | | |
|---|---|---|---|
| | Crude Oil | Electricity | Diesel |
| Per Hour | $ .003 | .007 | .008 |
| Per 24 Hour Day | .082 | .18 | .205 |
| Per 30 Day Month | 2.481 | 5.40 | 6.174 |

**DIESEL ENERGY CORPORATION**

82 Beaver Street, New York 5, N. Y.

*Oilfield Representative:*

**TEXOMA SUPPLY COMPANY** • Mayo Building, Tulsa, Oklahoma

*Distributor for Texas, Louisiana, New Mexico:*

**SOUTHERN ENGINE AND PUMP CO.**
2401 McKinney Ave., Houston, Texas

*Branches in:*
Dallas - Kilgore - San Antonio - Beaumont
Edinburg - Corpus Christi - New Orleans
Lafayette

# NEW WORLDS

He's Edison, Marconi, Bell . . . Lister, Pasteur, Roentgen . . .
science on the hunt probing the unknown to benefit man.

His spirit . . . eager, objective, searching . . .
pervades our industry, too. Gas and oil are always
seeking new ways to serve.

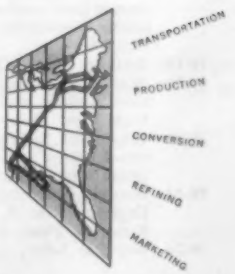
We're part of that continuing search. We explore for and
produce gas and oil from the Gulf to Canada.
We transport natural gas through our 2200-mile pipeline
system. We extract and convert hydrocarbons for
industry . . . refine and market petroleum products.

Expanding activities such as this mean widened opportunities
for all of us . . . broader service to America.

**TENNESSEE GAS** TRANSMISSION COMPANY

AMERICA'S LEADING TRANSPORTER OF NATURAL GAS

HOUSTON, TEXAS



National Safety Congress, Conrad Hilton Hotel, Chicago.

22-23 National Association of Corrosion Engineers, western region, corrosion control course, U. S. Grant Hotel, San Diego, Calif.

22-25 Southwestern Federation of Geological Societies, regional meeting, Mineral Wells, Tex.

22-24 Society of Automotive Engineers, national diesel engine meeting, Lord Baltimore Hotel, Baltimore.

23-24 Rocky Mountain Oil and Gas Association, annual fall meeting, Town House Motel, Omaha.

23-24 Western Petroleum Refiners Association, refining technology and industrial relations meeting, Rufus Garrett Hotel, El Dorado, Ark.

27-28 Independent Petroleum Association of America, annual meeting, Statler-Hilton Hotel, Dallas.

26-28 Gulf Coast Association of Geological Societies, Driscoll Hotel, Corpus Christi, Tex.

26-31 American Institute of Electrical Engineers, general meeting, Pittsburgh.

31 Natural Gasoline Association of America, Southern regional meeting, Carlton Hotel, Tyler, Tex.

**NOVEMBER**

5-6 Society of Automotive Engineers, national fuels and lubricants meeting, Mayo Hotel, Tulsa.

6-7 American Association of Petroleum Geologists, Pacific section annual meeting, Los Angeles.

6-7 Louisiana Polytechnic Institute, School of Engineering, seventh annual instrumentation conference, Ruston, La.

6-8 Geological Society of America, national convention, St. Louis.

10 Transportation Club of the Petroleum Industry, annual meeting, Bismarck Hotel, Chicago.

10-13 American Petroleum Institute, thirty-eighth annual meeting, Conrad Hilton, Palmer House, and Congress hotels, Chicago.

18-20 Ninth National Conference on Standards, Hotel Roosevelt, New York.

18-20 National Conference on Air Pollution, Sheraton-Park Hotel, Washington, D. C.

20-21 American Society of Civil Engineers, structural division and Kansas City section, conference on electronic computation, Kansas City.

21 Natural Gasoline Association of America, Panhandle Plains regional meeting, Herring Hotel, Amarillo, Tex.

30-Dec. 5 American Society of Mechanical Engineers, annual meeting, Statler and Sheraton-McAlpin hotels, New York.

**DECEMBER**

1-3 Interstate Oil Compact Commission, annual meeting, Kansas City.

2-4 Asphalt Institute, annual membership meeting, Shoreham Hotel, Washington.

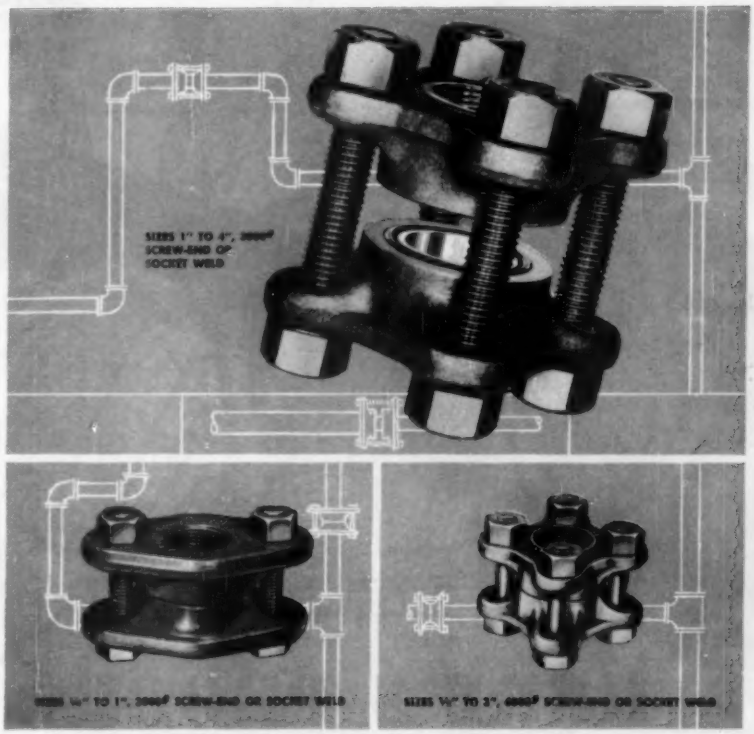
7-10 American Institute of Chemical Engineers, annual meeting, Netherland Plaza Hotel, Cincinnati.

9-13 National Association of Corrosion Engineers, University of Illinois, biennial short course on cathodic protection.

**FEBRUARY**

1-6 American Society for Testing Materials, D-2 committee on petroleum products and lubricants, Sheraton-Jefferson Hotel, St. Louis.


**W-S The double diamond assures double value**




**Installation flexibility with permanent piping strength**

# GET BOTH WITH W-S O-RING FLANGE UNIONS

NOW, you can install high pressure piping systems that can easily be rearranged and adapted with full assurance that the unions will give the leak-proof service of permanent installations. This is made possible by these adaptable features of W-S O-Ring Flange Unions:

- Available in 2-bolt and 4-bolt types, according to size.
- Sizes ¼" to 1" in 2-bolt 3000#; sizes 1" to 4" in 4-bolt type 3000#; sizes ½" to 3" in 4-bolt type only 6000#.
- Available in Screw-end and Socket Welding Types—3000# and 6000#.
- O-Rings available in a variety of materials for a wide range of service.

Specify forged steel W-S O-Ring Flange Unions for a tight seal against fluid pressure in piping for hydraulic machinery, refrigeration piping, steam and water lines, process liquid and gas lines, and many other applications.

*For full specifications, write for Bulletin U-1-58*

W-S manufactures a full range of high quality drop forged fittings, unions and couplets . . . in carbon, stainless and alloy steels. For full information about these products, or for your specification forging requirements, write to: W-S Fittings Works, H. K. Porter Company, Inc., Box 95, Roselle, N. J.

**H. K. PORTER COMPANY, INC.**

FORGE AND FITTINGS DIVISION

W-S Fittings Works, Roselle, N. J. • Cleveland Forge Works, Cleveland 4, Ohio
Stainless Steel Works, Duncannon, Pa.

# HERE'S PROOF* . . .

## BOSTON'S *B-228* PROCESS MORE THAN DOUBLES O.S.&D. HOSE RESISTANCE TO SUN AND WEAR!

You are looking at dramatic proof that the new B-228 Process developed for the covers of BOSTON Oil Suction and Discharge Hose more than doubles resistance to sun, abrasion and tearing! Each of these two swatches of O.S. & D. Hose covers has aged for exactly the same length of time. The upper swatch from the BOSTON cover is as good as new. The lower swatch from the ordinary cover is cracked, torn, and deteriorated.

This is news. This is important. Now BOSTON'S new B-228 Process provides entirely new protection against 90% of O.S.&D. Hose failures. Without question, BOSTON O.S. & D. Hose can sharply cut your hose replacement cost. Specify BOSTON next time you buy!

**228% GREATER RESISTANCE TO SUN DAMAGE**

**212% GREATER RESISTANCE TO ABRASION**

**207% GREATER RESISTANCE TO TEARING**

*Unretouched Photograph

**BOSTON**

**BOSTON WOVEN HOSE & RUBBER COMPANY**
DIV. OF AMERICAN BILTRITE RUBBER CO., INC.
**BOSTON 3, MASS.**

The OIL AND GAS JOURNAL

TULSA, OKLAHOMA

Published every Monday by The Petroleum Publishing Co., 211 South Cheyenne Avenue, Tulsa, Okla. Phone Diamond 3-6291. Founded in 1902. Name changed to The Oil and Gas Journal in 1910 by Patrick C. Boyle.

•

P. C. LAUINGER
President
S. H. ROURKE
Executive Vice President
KENNETH B. BARNES
Vice President and Editorial Director
MITCHELL TUCKER
Vice President and Advertising Manager
HANSON B. PIGMAN
Circulation Manager
DONALD W. WILSON
Manager Industry Census Department
J. PARKER HOLLAND
Production Manager

ADVERTISING OFFICES

TULSA
211 South Cheyenne, Diamond 3-6291
JOHN D. REILLY....Mid-Continent Manager
ROY E. FINLEY.....Representative
D. B. MILLER.....Classified Adv. Mgr.

NEW YORK
500 Fifth Avenue, LOngacre 4-6160
E. S. KLAPPENBACH.....Eastern Manager
HARRY B. BULLEN.....Representative

PHILADELPHIA
1509 Land Title Building
Broad and Chestnut Streets,
Rittenhouse 6-0118
JOHN W. MEANY, JR.....District Manager

CHICAGO
105 West Madison Street, CEntral 6-2537
DAVID T. KENNEY.....District Manager
KAREL WEGKAMP.....District Manager

DETROIT
204 Washington Square Building
Royal Oak, Mich., LIncoln 7-9455
JOHN D. YODER.....District Manager

PITTSBURGH
106 Nelson Avenue, FRemont 1-7775
ALFRED M. JONES.....Manager

HOUSTON
802 American Investors Building
CApitol 4-7726
JOHN M. SPEARS.....Gulf Coast Manager

DALLAS
1238 Mercantile Building
Riverside 8-3074
PREN G. HOLLINGSWORTH..Representative

LOS ANGELES
650 South Grand Avenue, MAdison 2-0722
GEORGE O. RUPPERT.....District Manager

ENGLAND
National Provincial Bank Chambers
15 Grafton Street, Altrincham
Phone Altrincham 3160
HARRY BECKER....European Representative

•

Subscription rates to the petroleum industry United States and foreign, 1 year, $5.00; 2 years, $8.00; 3 years, $10.00. Single copies $1.00. Back copies when over a year old, $2.00. Note: Payments from outside the U.S.A. may be made by international money order, New York exchange, or check on a U.S.A. bank. Second-class postage paid at Tulsa, Okla. Copyright 1958 by The Petroleum Publishing Co.

Member
Audit Bureau of Circulations
Associated Business Papers

# JOURNALLY SPEAKING

## Smart Bugs

IT'S VERY discouraging. Not to say humiliating. To be outdone by prehistoric bacteria milling around in the Earth's primordial ooze. Bugs you can't even see.

In case you're confused, we're talking about a series of learned treatises by one Bartholomew Nagy which appeared in the Big Yellow Book this past summer. His subject: The Fundamentals of Geochemistry.

Don't leave, this gets better. Actually, Dr. Nagy collected an enthusiastic following from among our readers and Dr. Frank Gardner who put him up to the whole thing has been flooded with requests for reprints.

But we bet that very few of these glowing accolades came from refining technologists. They've been had, according to the windup story which came out August 25. Now for years our chemists, physicists, and engineers have been working like dogs to develop processes for these high-powered tailormade chemicals that go into gasoline. You know—triptane, isooctane, toluene and all that. We got so smart we could hardly stand ourselves.

All this magic takes place in asceptic stainless steel towers and reactors with special catalysts and operating conditions controlled right down to the last decimal point.

Now along comes Nagy who tells us that these bacteria with the help of plain common mud as catalyst have been doing all this and more, for Heaven knows how many million years. To top it off, this messy combination has been employing the carbonium ion exchange mechanism which we just figured out a few years ago.

If we read Nagy right (and we're not too sure of that) he's quoting half the long-hairs in the field of geochemistry to the effect that practically all the new-fangled processes we've sweated up are old hat.

It seems that rotted vegetation was first worked over by these bugs, which broke it down to simple methane and like that. But oil is made up of very complex hydrocarbons. So complex that the whole industry working through an API research project for 25-odd years has barely scratched the surface in separating them and identifying them. How did all these thousands of complicated molecules get that way from all this rot?

Easy, say these smart geochemists. Catalytic cracking, alkylation, reforming, and we shudder to think what else, took place right down there in the mud. The catalysts were there all the time, in the form of trace metals. They took up where the bugs left off. Gradually, over the millenia all these fancy hydrocarbons took shape, then wandered off through porous sandstone to accumulate in oil fields.

It's humbling to think of it. We've spent billions of dollars to learn to do what Nature has been up to since the first dinosaur stepped on a fern.

Oh yes, the reprints. They're a mere 50 cents each for the whole batch. Read 'em and weep, you refining technologists.

## Where's Henry?

The familiar signature at the bottom of this column may appear only spasmodically for a while.

It was missing 2 weeks ago, there last week, and missing again today. Henry Ralph, the man with the two first names, is bogged down in history. For months he and others have been devoting most of their time to fascinating research on the development of the oil industry during its first 100 years.

Loyal readers who like Henry's style will be able to gorge themselves on his prose early next year when the Journal publishes Petroleum Panorama—an extra issue tracing meticulously the history of all divisions of the oil industry and saluting this vital industry on its 100th birthday.

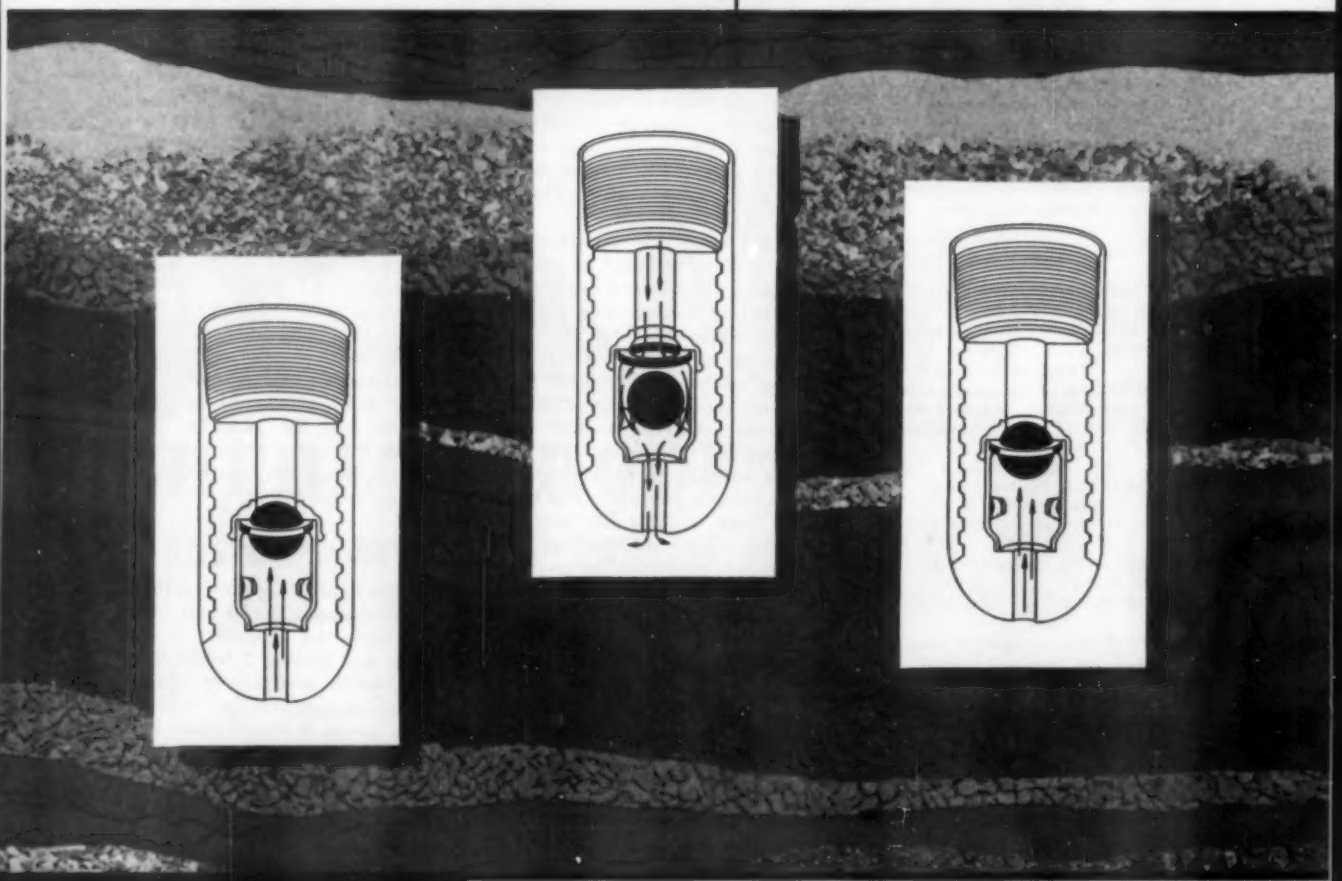
It's been a tremendous task of research, fact and photo gathering, and writing. At the moment Henry is spending all of his time researching the trends which shaped the course of oil.

He'll be back on this page when he finishes.

*George Weber*

# NOTHING SEALS LIKE THE *BAKER* "FLOATING" BALL

It "rolls with the punch" of circulating fluid and cement slurry — never stationary long enough to be eroded or cut away in any one place on its continuously smooth sealing surface.



### RUNNING IN

The floating ball — in the securely anchored Bakelite cage — maintains a leak-proof back-pressure seal against high- or low-pressure differential while the casing is "floated" down the hole. Note the absence of springs or guides to warp or stick and prevent a positive shut-off.

### CEMENTING

**Ample passageways are provided for the cement slurry, which cannot erode or damage either the protected sealing ring or the revolving ball as it rests on strong fingers in the Bakelite valve cage. When cementing is completed and pump pressure is stopped...**

### AFTER CEMENTING

**...the ball floats upward to seat and seal instantly against the recessed sealing ring. There are no aluminum parts or steel springs to drill up — only Baker concrete and Bakelite which break up into small fragments and circulate out of the hole.**

**For better all around PRIMARY CEMENTING use Baker Casing Centralizers and Baker Wall Scratchers with *your* choice of Baker Cementing Shoes and Collars.**

## *BAKER* SHOES AND COLLARS

*with the dependable Floating Ball*

**BAKER OIL TOOLS, INC.** HOUSTON · LOS ANGELES · NEW YORK

# The new imports plan has much to commend it

THE administration's new plan for allocating imports of crude and unfinished oils looks like a big step in the direction of a workable, permanent program.

It isn't perfect. Critics will doubtless list many flaws. But in sum total these may be no worse than the inequities, uncertainties, and improvisations of the present method.

The invitation is open for any suggestion for dividing the total more fairly without raising formidable administrative complications. But whatever imperfections it may contain, the proposal has these basic features to commend it:

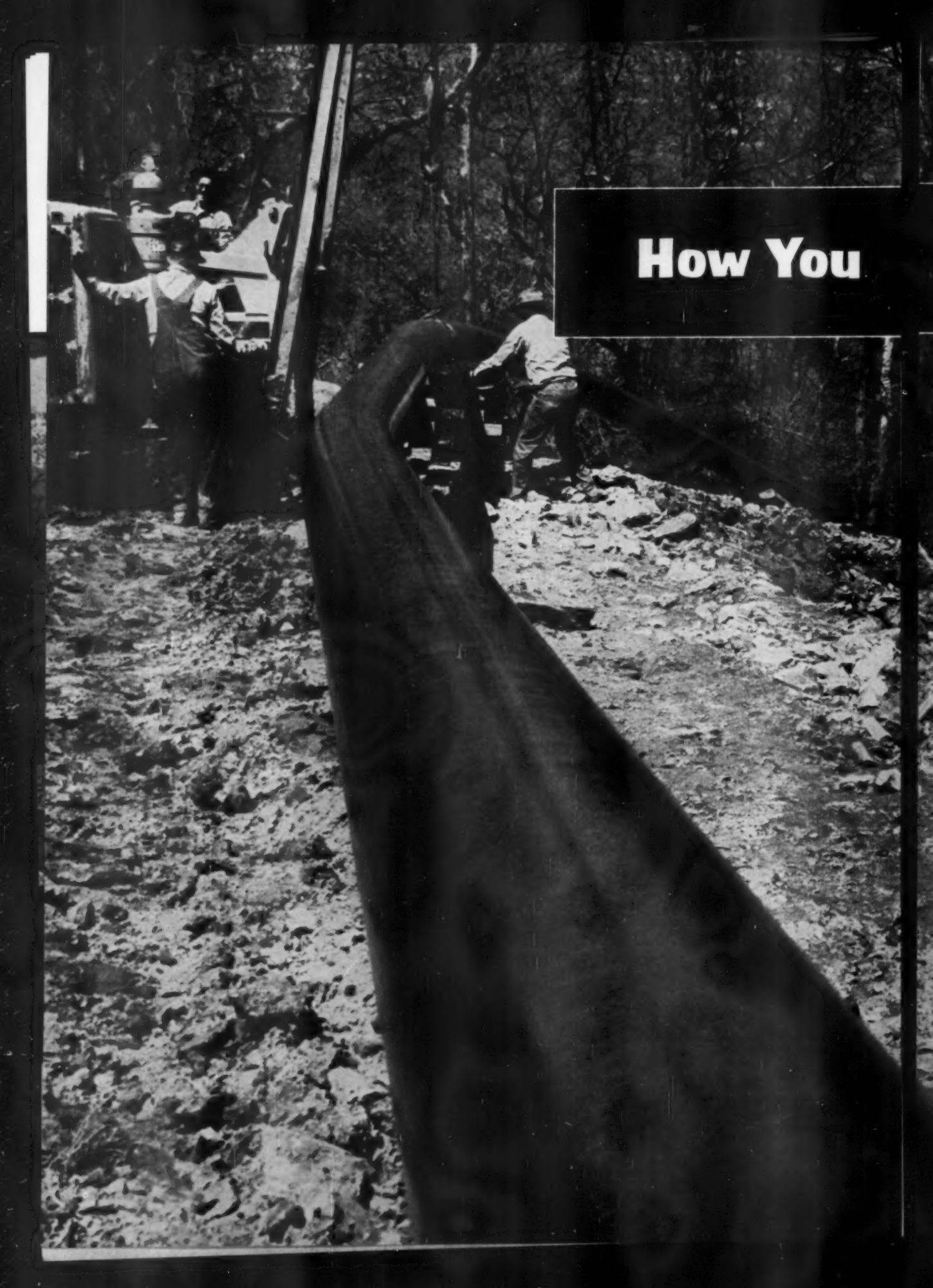
- It is clear cut, administratively simple, and involves a minimum of government control and bureaucratic discretion.
- It offers few opportunities for evasion, and should be virtually self-executing.
- It confines imports to the segment of the industry that uses them, namely refiners.
- Individual quotas are based on a simple mathematical formula—i.e., refinery runs.
- The over-all limitation is based on total demand—a sounder yardstick than one based on domestic production.
- It makes reasonable provision for newcomers.
- It provides for hardship cases and special import situations.
- It has the flexibility to meet changing conditions in the future and to correct some inequities in its operation.
- It is sufficiently specific to let everyone concerned know where he stands, and is projected far enough into the future to permit long-range planning.
- The need for settlement on a definite and workable plan, even one short of the ideal, is great enough to outbalance individual dissatisfactions as to the number of barrels in any quota or in the total figure.

THESE ARE OBJECTIVES that should have the endorsement of the entire industry. They should be retained no matter what changes are proposed in details or methods of operation.

But the question remains whether the plan's basic premise is sound, in spite of the attractiveness of its simple formula.

Is it right to impose severe cutbacks on those companies which, years ago, spent millions of dollars building up foreign production in the face of terrific obstacles? Is it right to hand import quotas on a silver platter to refiners with no foreign production and no use for foreign oil but to sell it back to its producers?

Couldn't a formula be devised to do justice in this regard without being too cumbersome to administer?


How You

# Profit From Multiple Testing

Multiple testing of every length of **J&L Electricweld Line Pipe** is your assurance of better performance during installation and operation.

(1) Every length is pressure-tested under the specified A.P.I. or A.S.T.M. hydrostatic test requirement both in time and in degree of pressure. Pneumatic hammers strike the pipe while it is under pressure to build up pressure surge.

(2) A series of visual inspections is made on each length of **J&L Electricweld.**

(3) Each length of pipe is given a crush test to determine weld strength and steel quality. The test complies with requirements of A.P.I. 5L, 5LX and with A.S.T.M. A-53, A-135 and equivalent specifications.

(4) Both ends of each joint of **J&L Electricweld Line Pipe** receive a magnaflux examination.

Discover how you can profit by using this high quality pipe in your next line by calling your local J&L Supply man today. Remember if it's sold by J&L . . . it's the best available.

**J&L Electricweld** is available in sizes 6⅝" O.D. through 12¾" O.D.

**Jones & Laughlin**

**SUPPLY DIVISION** – Tulsa

If it's sold by J&L . . . .
It's the best available

# Protection...at Less Cost

## 'INCOR' SULPHATE RESISTANT CEMENT PROVIDES MONEY-SAVING LIGHTWEIGHT SLURRY AND HIGH-VOLUME FILL

● Where high-volume fill-up and lightweight slurries are necessary to protect the intermediate as well as other strings of pipe, use 'Incor' Sulphate Resistant Cement—your assurance of the utmost in protection and economy.

As the drawing indicates, some wells, as in the Permian, require larger quantities of lightweight cement slurry—as much as 6,000 cubic feet—for washed out salt sections and to insure return of cement slurry to the surface because of lost circulation problems. 'Incor' Sulphate Resistant Cement reduces cost of "waiting on cement" and provides a lower cost-per-cubic-foot of slurry back of the casing.

Whatever may be your oil-well cementing problem, there's a Lone Star cement to answer your needs—cements proved thousands of times under every oil-field condition. For maximum protection always use Lone Star Cements.

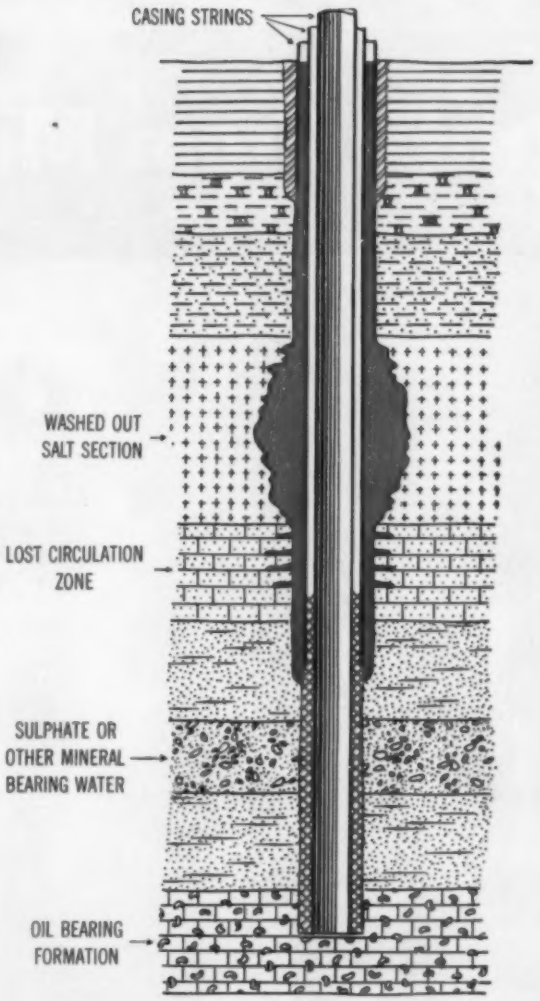
**LONE STAR PORTLAND CEMENT**—the standard of quality for a half century

**'INCOR'*** America's First High-Early Sulphate Resistant Cement

**'STARCOR'*** Slow-Setting Oil Well Cement

**'TEXCOR'*** Deep Oil Well Cement

*Reg. U.S. Pat. Off.




PROTECTION—under conditions typical of Permian Basin area.

THERE'S A LONE STAR CEMENT FOR EVERY OIL FIELD NEED

## LONE STAR CEMENT CORPORATION

*Offices:* DALLAS • HOUSTON • ABILENE, TEX. • LAKE CHARLES, LA. • NEW ORLEANS • BIRMINGHAM • KANSAS CITY, MO. • ALBANY, N. Y. BETHLEHEM, PA. • BOSTON • CHICAGO • INDIANAPOLIS • NEW YORK • NORFOLK • RICHMOND • SEATTLE • WASHINGTON, D. C.

The OIL AND GAS JOURNAL

# Jet-Age Fuel Estimates Are Trimmed

THE JET AGE—which is coming with a rush—is going to make kerosine a big-volume product of the petroleum industry.

But the soaring kerosine demand won't fly nearly so high as was thought a year or so ago.

The reason: Speed of the jets, plus their huge carrying capacity, will permit airlines to do their job with fewer flying hours than they had anticipated.

Even so, there will be no great surplus of kerosine-type jet fuels. Crudes yielding low-freeze-point kerosine are not universal, and in some areas they are particularly scarce.

One major company, in fact, has quit negotiating jet-fuel contracts because it has no more of these crudes in sight.

Domestic airlines will be flying 128 jets and turboprops by the end of the year and have 379 more on order. Foreign airlines have 408 in service now, and deliveries are scheduled on 362 more.

**Fuel picture . . .** Kerosine will gain in a big way in the new jet age, but demand will be slightly less than expected a year ago.

Estimates then were that demand would gradually rise to 175,000 bbl. per day by 1961. Now it looks more like 150,000 bbl. per day by 1962.

Current kerosine-type fuel demand of a few thousand barrels per day is expected to grow to 35,000 bbl. in 1959, to 70,000 bbl. in 1960 and to 140,000 to 150,000 bbl. per day, domestically, by 1962.

The big boost will result from the airlines' choice of kerosine-type jet fuel, as predicted a year ago by Journal editors (OGJ, Sept. 9, 1957, p. 51).

In making the choice the airlines broke with the military on fuel requirements. The Army, Navy, and Airforce are sticking principally with JP-4 as jet fuel.

The issue was still in doubt a year ago, although the airlines were leaning toward kerosine. It was resolved beyond all doubt recently when airlines began letting contracts. Four major lines, TWA, United, Eastern, and American, disclosed near-term requirements and all specified a kerosine-type fuel. These airlines alone will ultimately take some 28,000,000 bbl. of kerosine a year, an average of more than 75,000 bbl. daily.

**Consumption . . .** The number of new airliners will more than double in the next 2 years, and most of the yet-to-come planes are the more fuel-hungry pure jets.

Jets gulp up to five times as much fuel per hour as a piston-powered plane. But that doesn't mean a comparable increase in over-all consumption.

The jets' high speed (some will cruise at 635 m.p.h.) and greater payload (as many as 150 passengers) will do much to offset their higher fuel-burning rate by cutting down on the amount of flying time.

In fact, the airlines expect to end up with the same passenger miles per dollar of fuel as at the present. This is partly due to various jet fuels costing less per gallon (about 5 cents) than gasoline.

Military needs for jet fuels also will keep climbing. And if demand for JP-4 starts slipping, JP-6 should start picking up. JP-6 is expected to be the fuel for tomorrow's supersonic jets.

**Avgas demand . . .** Commercial requirements for avgas will not drop as drastically as military demand.

Piston-powered planes are not going out of fashion yet—163 of them, mostly four-engine units, are scheduled for delivery to airlines this year. And as piston planes are replaced with

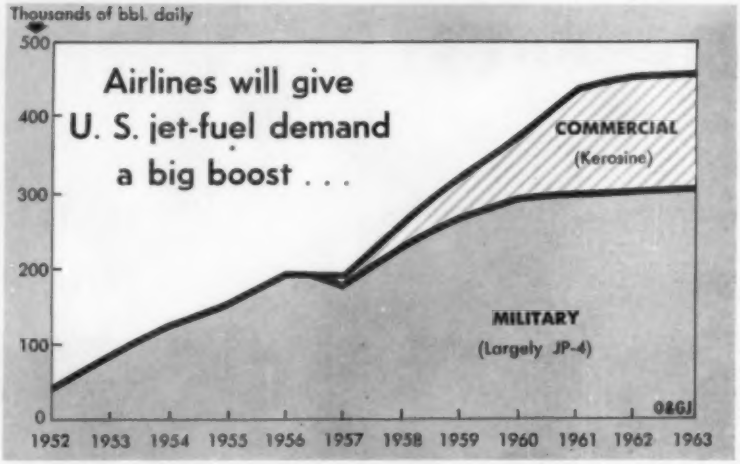
Lockheed Electra

Vickers Vanguard

Fairchild Friendship F-27

Vickers Viscount (above)

Convair 600 (below)




jets by the larger airlines, the second-hand piston planes will be put into service by the smaller airlines.

**Fuel suppliers . . .** Contracts to supply the airlines are on at least a 3-year basis. Some airlines negotiated 6-year contracts with optional extensions to insure the right quality and quantity of jet fuel in case demand exceeds supply.

Because it covers huge volumes of an entirely new product, setting up a world-wide distribution system is a big undertaking.

This is illustrated by Eastern Air Lines. Eastern contracted for 12,500,000 bbl. of jet fuel over a 3-year period with Cities Service Oil Co., Esso Standard Oil Co., Gulf Oil Corp., Shell Oil Co., Sinclair Refining Co., Standard Oil Co. of Ohio, and The Texas Co.

The largest fuel order in the history of commercial aviation was made by American Airlines, Inc. American contracted for 95,000,000 bbl. over the next 10 years with Esso, Shell, Richfield Oil Corp., Humble Oil & Refining Co., Gulf, Standard Oil of Ohio, Standard Oil of Kentucky, The Texas Co., and Magnolia Petroleum Co.

**Fuel specs . . .** The transition into the jet age has been marked by controversy regarding specifications.

One involves the freezing point of kerosine fuel at minus 40° F. Many airlines favor a lower freezing point as a safety factor since the jets operate in cold climates and at high altitudes. The British issued new specifications, and it's a safe bet the American Society for Testing Materials will follow suit and set up minus 58° F. as the freeze point in the kerosine Type C specs now being studied.

Fuel specs are getting tighter. One big factor in this has been the lack of thermal stability of the fuel. This has caused the military to include thermal stability in its specs.

The marcaptan sulfur content in JP-4 also has been tightened to require 0.001 weight per cent maximum instead of the previous 0.005% maximum. This requires severe processing on the part of the refiner. Smoke volatility index on JP-4 is now 52.0 minimum, a change from the previous 54.0 minimum.

There is still indecision on the smoke point which is now at 20 mm. minimum in the kerosine specs. There is some pressure to get this moved to 25 mm. to cut down engine wear. Presence of aromatics has an effect on smokiness and they have become a bit suspect. However, this is not the only reason to avoid aromatics. Studies show that elastomers used as sealants on fuel tanks have a tendency to swell in the presence of aromatics. Later introduction of a fuel quite low in aromatics content may cause the elastomer to shrink and leakage to occur.

When there is a 10-point spread in aromatics content in fuels, conditions begin to get critical in this respect. Most jet fuels vary from 9-12% aromatics content, and the minimum and maximum limits have run 6-16%. Meanwhile, the current specification limit of 20% maximum on kerosine will permit materials to enter the fuel tanks which can cause serious leakage problems.

The controversy regarding fuel specifications doesn't presage several different jet fuels, however. The factor of economics is coming into play.

One fuel means less handling, fewer storage problems, and better refueling systems. That fuel is bound to be kerosine. And it's sure to be a kerosine with more rigid specifications.

# Number of Jets, Turboprops Climbing

| | Pre-1958 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 |
|---|---|---|---|---|---|---|---|
| **Medium-range turboprop transports:** | | | | | | | |
| U. S. | 63 | 38 | 24 | ... | ... | ... | ... |
| Foreign | 256 | 102 | 45 | ... | ... | ... | ... |
| Total | 319 | 140 | 69 | ... | ... | ... | ... |
| **Long-range turboprop transports:** | | | | | | | |
| U. S. | ... | 21 | 86 | 17 | 0 | ... | ... |
| Foreign | 18 | 24 | 6 | 44 | 10 | ... | ... |
| Total | 18 | 45 | 92 | 61 | 10 | ... | ... |
| **Medium and long-range jet transports:** | | | | | | | |
| U. S. | ... | 6 | 80 | 141 | 16 | 18 | ... |
| Foreign | ... | 8 | 43 | 137 | 18 | ... | 59 |
| Total | ... | 14 | 123 | 278 | 34 | 18 | 59 |
| **Combined turboprop and pure jets:** | | | | | | | |
| U. S. | 63 | 65 | 190 | 158 | 16 | 15 | ... |
| Foreign | 274 | 134 | 94 | 181 | 28 | ... | 59 |
| **Grand total** | **337** | **199** | **284** | **339** | **44** | **15** | **59** |

# Jets Have Big Appetite for Fuel

| Plane— | Type turboprop or jet | Fuel capacity (gal.) | Consumption average (gal./hr.) | Number fueling points | Fueling rate (gal./min.) | Speed cruising (m.p.h.) |
|---|---|---|---|---|---|---|
| **Bristol** | | | | | | |
| Britannia (250-300-310) | TP | 10,300 | 794 | 2 | 360 | 400 |
| Britannia 100 | TP | ... | 723 | 2 | 360 | ... |
| **Boeing** | | | | | | |
| 707-120 | J | 13,500-17,400 | 2,200 | 4 | 1,250 | 575 |
| 707-120 | J | 15,500 | 2,200 | 4 | 1,550 | 575 |
| 707-320 | J | 21,200 | 2,200 | 4 | 1,250 | 575 |
| **Convair** | | | | | | |
| 600 | J | 15,110 | 1,452 | .. | .... | 635 |
| 880 | J | 10,770 | 1,305 | 8 | 1,800 | 615 |
| **De Havilland** | | | | | | |
| Comet IV | J | 10,500 | 1,700 | 2 | 532 | 500-545 |
| **Douglas** | | | | | | |
| DC-8 (Domestic) | J | 17,600 | 2,200 | 4 | 1,200 | 561-589 |
| DC-8 (Intercont.) | J | 21,600-23,300 | 2,200 | 4 | 1,200 | 590 |
| **Fairchild** | | | | | | |
| Friendship F-27 (airline) | TP | 1,330 | 182 | 4 | 150 | 280 |
| Friendship F-27 (exec.) | TP | 1,660 | 182 | 4 | 150 | 280 |
| **Lockheed** | | | | | | |
| Electra | TP | 5,360 | 725 | 1 | 300 | 400 |
| **Sud Aviation** | | | | | | |
| Caravelle | J | 5,000 | 680 | 2 | 820 | 510 |
| **Vickers** | | | | | | |
| Viscount (700 series) | TP | 2,299 | 420 | 2 | 340 | 325 |
| Viscount (810-840) | TP | 2,616 | .... | .. | .... | 365-400 |
| Vanguard | TP | 6,125 | .... | .. | .... | 400-425 |
| VC-10 | J | .... | .... | .. | .... | .... |

Vickers VC 10

Sud Aviation's Caravelle

Convair 880

De Havilland Comet 4 (above)
Douglas DC-8 (below)

## New Imports Plan: Some Win, Some Lose, Some Break Even

(Districts 1-4, thousands of barrels daily)

| | Present quota | Quota 1-1-59 | Quota 7-1-59 | Quota* 1-1-60 | | Present quota | Quota 1-1-59 | Quota 7-1-59 | Quota* 1-1-60 |
|---|---|---|---|---|---|---|---|---|---|
| Atlantic Refining | 50.2 | 50.2 | 30.2 | 21.3 | Phillips | 10.2 | 15.5 | 20.9 | 26.2 |
| Aurora Gasoline | 3.5 | 4.1 | 5.5 | 6.8 | Pure Oil | 5.0 | 10.9 | 14.8 | 18.5 |
| Bay Refining | 2.9 | 2.9 | 2.9 | 2.9 | Republic Oil | 4.0 | 4.0 | 4.5 | 5.6 |
| Cities Service | 27.8 | 27.8 | 27.8 | 29.0 | Shell | 6.4 | 23.7 | 32.0 | 40.0 |
| Clark Oil | 2.0 | 2.3 | 3.0 | 3.8 | Sinclair | 53.0 | 53.0 | 53.0 | 45.9 |
| Continental | 5.0 | 8.9 | 9.0 | 15.1 | California Standard | 56.9 | 56.9 | 30.9 | 21.7 |
| Crown Central | 4.3 | 4.3 | 4.3 | 4.1 | Socony | 57.2 | 57.2 | 57.2 | 50.2 |
| Danaho Refining | 0.5 | 0.5 | 0.5 | 0.5 | Indiana Standard | 25.4 | 44.3 | 59.8 | 74.7 |
| Delta Refining | 3.0 | 3.0 | 1.7 | 1.2 | Jersey Standard | 61.4 | 61.4 | 76.3 | 98.4 |
| Eastern States | 15.6 | 15.6 | 8.9 | 6.3 | Ohio Standard | 7.0 | 8.4 | 11.3 | 14.1 |
| Gabriel | 6.0 | 4.0 | 2.0 | 0 | Sun Oil | 43.0 | 43.0 | 36.6 | 25.8 |
| Great Northern | 28.1 | 28.1 | 28.1 | 28.1 | Sunray | 5.0 | 7.0 | 9.4 | 11.7 |
| Gulf | 95.1 | 95.1 | 85.6 | 60.1 | Southwestern | 2.5 | 3.0 | 4.1 | 5.1 |
| Hess, Inc. | 9.8 | 6.6 | 3.2 | 0 | Tennessee Gas | 3.5 | 3.5 | 3.5 | 3.5 |
| Ingram Oil | 3.5 | 3.5 | 2.3 | 1.6 | Texaco | 46.4 | 46.4 | 49.1 | 61.4 |
| International Refining | 10.5 | 10.5 | 10.5 | 10.5 | Texas Asphalt | 2.0 | 1.8 | 0.6 | 0.4 |
| Lakehead Pipeline | 0.3 | 0.3 | 0.3 | 0.3 | Texas City | 4.0 | 4.0 | 4.0 | 3.5 |
| Lake Superior | 4.3 | 4.3 | 4.3 | 4.3 | Tidewater | 29.2 | 29.2 | 17.3 | 12.2 |
| Northwestern Oil | 11.5 | 11.5 | 11.5 | 11.5 | United Refining | 3.0 | 3.0 | 1.2 | 0.8 |
| Ohio Oil | 3.5 | 3.5 | 3.4 | 4.3 | | | | | |

*1960 quotas based on 10.11% of total demand and 90% capacity.

# What the Imports-Control Plan Means

• Refinery runs will set quotas under this new concept of control. Carson's newest plan spreads benefits of imports among all refiners, while whacking several majors to make room for newcomers. Reaction is swift—and pointed.

THE GOVERNMENT'S new import control plan for Districts 1-4 is out in the open for the industry to shoot at.

Officials freely admit they expect a flood of comment in the 30 days given the industry to submit its views.

Much of the reaction is expected to be critical, but Capt. M. V. Carson, Jr., imports administrator, warned that if the plan isn't acceptable it will be up to the industry to offer something better.

The new plan, probably with some modifications suggested by the industry, will go into effect January 1. Here in brief, is what it will do:

... **The over-all level of crude imports** will be increased from the present 713,000 bbl. to 751,300 bbl. daily.

... **Imports of unfinished gasoline** and other oils will be cut from the May-June average of 155,000 bbl. to 75,000 bbl. daily.

... **Every refiner will be entitled** to a quota for the first 6 months of 1959 of not less than 6% nor more than 37½% of his reported capacity. Thereafter, quotas will be based on runs.

... **For the last half of 1959,** all will be entitled to quotas of not less than 9% of throughput, but those with the highest percentage allocations will be cut back so far as needed to cover the increase.

... **All refiners** will be put on the same percentage of runs effective January 1, 1960.

... **Present quota holders** with no refining capacity will have to obtain some capacity or lose their import privileges by the end of next year.

... **Refiners dependent on Canadian oil** because they cannot get year-round supplies of domestic crude will be protected.

... **Special treatment** will be given imports of asphaltic crude to assure an adequate supply of asphalt for the big federal highway program.

... **Puerto Rican refineries** will be brought into the program but on a different basis. They will get quotas equal to the average barrels per day of crude processed during the current quarter.

... **The present program** will be continued, and no new quotas will be granted through the remainder of this year.

**How it works** . . . The increase in the over-all crude allowable with which the new system will be ushered in is based on optimistic estimates by the Bureau of Mines of an upturn in domestic output, Administrator Carson explained.

The bureau estimates that production during the year ending next June 30 will average 6,261,000 bbl. daily. This will be an increase of 504,000 bbl. daily over the average of 5,757,000 bbl. a day for the year ended last June 30.

The new system will use total demand rather than domestic production as the base on which to figure allowable imports. The change was made necessary by the merging of the

crude and unfinished oils programs, now separate.

The shift to a demand base, however, was not unexpected, Carson explained. It was called for as a later step in the July 1957 report of the cabinet fuels committee.

The 751,300-bbl. crude allowable will represent 12% of the expected domestic production, the same relation as heretofore. The addition of 75,000 bbl. of unfinished oils will bring the over-all total to 826,300 bbl. daily. That will be 10.11% of a total demand estimated at 8,173,000 bbl. daily.

The 10.11% ratio will apply through 1959. But Carson said the figure may be shifted, up or down, by the cabinet committee in subsequent orders, if necessary.

**The details . . .** The specific rules for figuring quotas beginning January 1, are as follows:

"Beginning January 1, 1959, for the period ending June 30, 1959, import allocations of importers of foreign crude oils are determined as follows:

"A—New importers and importers having allocations in effect prior to January 1, 1959, which allocations are less than 6 per cent of the importer's reported refinery capacity are granted import allocations equal to 6 per cent of such capacity.

"B—Importers having allocations in effect prior to January 1, 1959, which allocations exceed 37½% of the importer's reported capacity, are limited to an allocation which will not exceed 37½% of such capacity.

"Effective July 1, 1959, and for the duration of the voluntary oil import program, allocations shall be determined as a percentage of annual refinery runs as follows:

"A—Allocations of importers which are less than 9% of the importer's refinery runs for the fiscal year ending March 31, 1959, are increased to 9% of such refinery runs, and the allocations of importers having the highest percentage allocations will be reduced beginning with the highest until that allocation is no higher than the next highest and continuing to reduce both allocations equally until they are no higher than the third highest and thereafter equally reducing the three allocations, and so on, as much as necessary to provide said increase.

"B—Beginning January 1, 1960, the allocations of all importers will be the percentage that the total of all allocations bears to the total refinery runs for fiscal year ending September 30, 1959, of all importers in Districts 1 through 4.

"C—Each 6 months thereafter the allocations of all importers will be the percentage that the total of all allocations bears to the total refinery runs for the preceding 12 calendar months, ending 3 months prior to the effective date of the allocation."

**Who's helped, hurt . . .** The result of the new system will be to cut back imports of many of the present largest importers.

These include Sun, Atlantic, Gulf, Standard of California, Eastern States, and Tidewater. These companies will be cut to 16% of throughput next July 1.

They will be further cut back on January 1, 1960, together probably with Socony, Sinclair, and a number of others.

On the other hand, some companies will get increases. These will include Standard of Indiana, Standard of New Jersey, Standard of Ohio, Phillips, Continental, Pure, and Shell.

Application of the new standards theoretically would cut Canadian oil imports from around 60,000 bbl. daily now to 20,000 bbl. However, it is expected that no cut actually will be made because all but one of the refineries along the northern tier of states cannot get assured domestic crude the year around.

As a result, the following refineries are expected to retain their present allocations: Bay, International, Great Northern, Northwestern, and Lake Superior. No decision has been made

# Company Comments:

THE NATION'S REFINERS have both praised and condemned the Government's proposed new import program. Generally, those who will profit are for it, and those who will suffer are against it.

At least two larger importers—Atlantic Refining Co. and Tidewater Oil Co.—have denounced the plan bitterly.

**The opposition . . .** Atlantic's president, Henderson Supplee, Jr., said bluntly his company will not comply with the voluntary program unless it is changed to recognize "individual company circumstances."

"The new plan violates the most fundamental principles of private enterprise — namely, that companies which assumed the risk of investments in production facilities are entitled to expect a fair return from their investment," Supplee said.

"Now the Government proposal, in effect, confiscates the fruits of their investments and distributes them on a pro rata basis among all oil companies, including those who have risked no capital and made no effort to obtain the benefits that would now be handed to them arbitrarily under the proposed revision."

Tidewater, likewise, blasted the plan.

"We are astounded that the Government would suggest such a program based on such questionable principles," said a company spokesman.

"The proposed plan would reduce oil import quotas for East Coast refiners who are established and logical users of foreign crude and have developed facilities for its use . . . Most inland refiners will merely sell their import quotas back to the seaboard refiners from whom they were taken. This transaction will result in an unearned profit for inland refiners selling quotas and places the Federal Government in the awkward position of sponsoring windfall profits for a special group."

**The supporters . . .** In contrast to Atlantic and Tidewater, three other leading importers were complimentary of the new formula.

Standard Oil Co. (Ind.), whose quota would rise from 25,400 bbl. to 74,700 by 1960, said the plan is "a tremendous advance in restoring equity among all refiners and insuring stable progress for the industry."

President John Swearingen said the program "will give all refiners a right to bring in foreign crude in direct proportion to their use of domestic crude, thus restoring the opportunity for competitive equality."

Standard Oil Co. (N. J.), whose quota would rise from 61,400 bbl. to 98,400 bbl. in 1960, said that the program, on initial examination, "generally seems to be sound."

Shell Oil Co.'s vice president for transportation and supply, D. B. Hodges, believed the new formula to be "more equitable" and a substantial improvement over the present system.

The nation's largest importer, Gulf Oil Corp., shied off from an immediate comment except to note that the

as to the treatment of the other importer, Lakehead Pipeline.

The plan provides specifically that the same relief shall be extended to refineries in District 5.

**Asphalt, unfinished oils . . .** Importers of asphaltic oils will be given a break by a special allowance for the asphalt actually derived from such crude.

Thus, a company bringing in 1,000 bbl. to make asphalt, from which he produces 650 bbl., will be charged only with 350 bbl. of oil against his quota.

But to be eligible for this allowance, the asphalt must have a penetration at 25° C. (77° F.) under a load of 100 g. applied for 5 seconds of not more than 100. The asphalt also must be sold as paving asphalt, binders, coatings, or waterproofing.

The cutback in imports of unfinished oils is tied to another restriction. No importer may bring in more than 10% of his quota in unfinished form.

**Special cases . . .** New importers coming into the picture after January 1 by reason of acquiring new refinery capacity will be given temporary quotas based on the designed capacity of their refineries.

This will be equal to 6% of such capacity if put into operation between July 1 and December 31, 1959. If brought in after January 1, 1960, the plant would have the same percentage as other refineries, calculated on 90% of the designed capacity.

Importers who increase their refining capacity will be given increased quotas in the same way but only to the extent necessary to maintain their relationship of imports to capacity or crude runs equal to but no greater than that of other importers with the lowest percentage.

An importer with a refinery put out of order by fire, explosion, or other disaster may retain his quota for 6 months, provided he assured the administrator that the refinery will be repaired within that period.

**Nonrefiners . . .** The new rules specify that a processing agreement between an importer and the owner or operator of a refinery will not be construed as constituting ownership of a refinery or its operating capacity.

Importers without refinery capacity now holding quotas will be reduced one third next January 1, another third July 1, and terminated at the end of the year unless they acquire operating refinery capacity. This would cover Gabriel and Hess, and possibly Texas Asphalt, whose refinery has not been in operation for about a year. Hess, however, is building a 45,000-bbl. refinery at Perth Amboy, N. J.

The plan specifies that quotas will not be transferable or assignable. All imports under an allocation must be reported and entered through customs by the quota holder. But after that he may dispose of his foreign oil as he wishes except in the case of importers getting hardship relief (as in the case of plants using Canadian oil). They must process all imports in their own plants.

**Other rules . . .** All allocations will be for 6-month periods. Failure to report imports as required by the administrator may result in withdrawal of an allocation.

The new program looks ahead in two directions. It will later be extended to District 5. And if any refineries are built in Hawaii and ship products made from foreign crude to the Continental U. S., they will be required to apply for import quotas.

**Objections invited . . .** This is not a "cut and dried" plan as seems to be thought in some quarters, Carson said. It is merely a proposal.

"We really want suggestions to show up any bugs or deficiencies making it impracticable," he said.

Carson indicated that the executive order barring government contracts to companies not complying with the program will have to be changed to cover unfinished oils.

Nobody is going to be 100% satis-

## Company Comments (con't)

company would be hard hit by the plan and that the industry has been given 30 days to state its position to the Government.

**Others approve . . .** Continental Oil Co., a smaller importer whose quota would be raised from 5,000 to 15,100 bbl. by 1960, gave cautious approval to the plan.

"Although we have not completely analyzed the proposed imports program, our first reaction is that it is a distinct improvement over the present program," Charles A. Perlitz, Jr., executive vice president, said.

Roland V. Rodman, president of Anderson-Prichard Oil Co. at Oklahoma City, spoke the sentiments of many inland independents by endorsing enthusiastically the principle behind the plan.

Rodman has long advocated import quotas based on refinery throughput.

While he was not ready to support the plan in detail until he had studied it further, Rodman said this: "Imports should be based on refinery throughput. All refiners should have the same opportunity. It is all concentrated now, and you can't have a healthy industry if that continues. That's why many companies today show a decline in profits."

R. W. McDowell, president of D-X Sunray Oil Co., Tulsa refiner, said the principle "is in line with my thinking for months as being the only sound approach."

"Somebody obviously is going to be cut," McDowell observed, "but when you get right down to it, if they are going to attempt to limit imports, I don't know how you can make sheep of one and goats of others. The program of definite percentages of refinery runs or capacity is the fairest way to approach it."

Some midwestern and Mid-Continent refiners already began figuring last week what the proposed program will mean to them in dollars and cents.

One group figured it this way:

Refineries with runs of 5,000 to 25,000 bbl. per day would each get a "bonus" of $400 to $2,000 per day by selling or exchanging their quotas of imported crude.

They arrived at the figures by presuming a 70-cent differential between the price of domestic crude and imported crude and multiplying the differential by the barrels of imports. The differential takes into consideration the unloading costs and duties.

Whether it would work out this way in practice is open to question. Inland refiners would have to find buyers for their crude, and the buyers would have to be willing to pay the price.

One refiner said his guess is that he would effect exchanges with companies that have both coastal refineries and inland domestic crude to sell.

"I doubt that we would simply sell the crude," he said.

Another said he might trade his quota or have it processed and trade the products.

Should an inland refiner be unable to effect a trade, he said, imports would be reduced by the amount of the quota. However, he conceded this is not likely to happen often.

fied with the new plan, Carson predicted. He pointed out that the Texas Independent Producers and Royalty Owners Association raised objections even before knowing what the plan was.

There will be objections because finished products are not included, he went on. But the cabinet committee, the Office of Defense and Civilian Mobilization, and the President haven't ordered products put under control, and Carson's job is merely to administer the program as handed to him.

Some interests will object that the level of imports is too high, but importers who will be cut back won't like the plan. And applicants for more than the quotas given them will feel they should have more.

"A very small minority is expected to give 100% approval," Carson said wryly.

Carson disclosed that of the 80 appeals for new quotas filed in anticipation of action this month, 17 which ask for a total of 245,500 bbl. daily are ineligible.

The 63 eligible applicants, with refinery capacity of 872,000 bbl., asked for quotas totaling 572,836 bbl. daily. Under the new system they probably will get around 52,000 bbl. initially.

The 24 present importers have requests on file for increases totaling 407,480 bbl. daily.

The 63 new applicants eligible for quotas represent 11.1% of the refining capacity in Districts 1-4. The present importers, with 6,620,000 bbl. capacity, represent 84.1%. The 71 companies that have not yet applied for quotas have a capacity of 380,000 bbl., or 4.8%.

**IPAA approves—but . . .** First reaction to the new plan was voiced by the Independent Petroleum Association of America.

"It is encouraging to us as a constructive step toward establishment of a definite long-range program for limitation of imports," said Gordon Simpson, IPAA president.

Simpson found deficiencies in the plan, however. He pointed out it would continue to permit imports of refined products without limitation. And it allows imports at a higher level than recommended in 1955 by the President's special committee.

IPAA will have some recommendations to submit to Carson within the next 30 days, Simpson said. But he saw the plan as a great improvement over the present system and commended those responsible for it "for sincere and able efforts to devise a workable program for meeting the problem of excessive imports."

## watching WASHINGTON

**Bertram F. Linz**

### • Refinery spending rising this quarter

REFINERS appear to see the economy as again on the upgrade. They are beginning to increase their spending for new plant and equipment.

Starting off with a mere $587 million in the first quarter and a modest $629 million in the next 3 months, they are spending $720 million this quarter, according to government figures.

But the industry is still cautious. The final quarter will show little further increase—to only $729 million.

Last year's downturn in business cut short a high-speed expansion movement in which a record $3,453 million was put into new plant construction against $3,135 million in 1956. This year's total is expected to be around $2,665 million, a drop of nearly $800 million from 1957.

The cutback in spending didn't extend to the gas industry, however. The gas and electric utilities expect to spend a record $6.3 billion this year, an increase of nearly $100 million over 1957.

### • Little man can get better financing

TWO DEVELOPMENTS, one current and the other prospective, may help ease the financing worries of small oil businesses.

The first is the small-business aid bill passed at the last session of Congress. It paves the way for setting up investment companies under government license to help little businesses with their long-term financing.

The aim of this provision is to make it easier to raise money for ventures too risky to meet bank law requirements.

The second development also is aimed at expanding funds available for investment. It is a bill which will be pressed in Congress next year cutting in half the tax rate on long-term capital gains.

Rep. Earl Wilson (R-Ind.), author of the bill, estimates that U. S. investors are passing up more than $200 billion in profits because of the 25% tax. But, Wilson believes, if the tax were cut, the investors would cash in these profits and use the money for other investments.

The Government, in turn, would collect $25 billion in extra tax revenue—even at the reduced rate—and could use it to reduce the national debt.

### • NLRB is spreading its jurisdiction

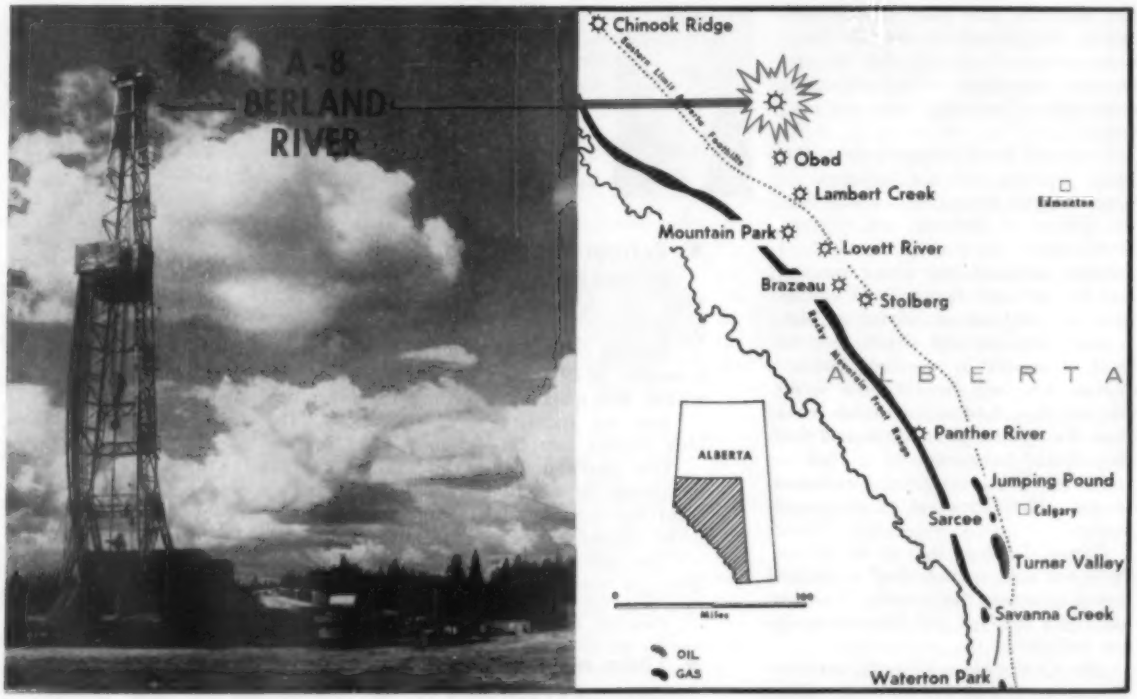
THE NATIONAL Labor Relations Board plans to use a $1.5-million bonus given it by Congress to take over what is now a labor-dispute twilight zone.

This will bring under NLRB review thousands of labor arguments involving small oil and other companies. These have been ignored in the past under standards of business volume set up by the board to keep its caseload within bounds.

Originally it was expected that these small-company disputes refused by the NLRB would be handled by state agencies. But the U. S. Supreme Court ruled that the states can't take over cases the NLRB won't consider. The result has been a sort of twilight zone in which neither employers or workers had anywhere to go to settle their differences.

As might be expected, labor unions are solidly in favor of expansion of NLRB operations. Industry is divided. But the Small Business Administration is opposed. Administrator Wendell B. Barnes favors having Congress give the states more authority.

The new standards will bring to the NLRB all disputes in firms doing $250,000 or more business annually. The present standard sets the figure at $1 million or more.




# Alberta Has World's Biggest Gasser

WESTERN ALBERTA'S A-8 Berland River gas well has added another "biggest" to an already impressive list of superlatives.

It's now rated the world's biggest gasser with a calculated open-flow potential of 1.5 billion cubic feet per day.

The Berland River well already claimed Canada's deepest production of any kind and the thickest reef ever found (OGJ, July 14, p. 153).

Drilled by British American Oil Co., Ltd., and Shell Oil Co. of Canada, Ltd., the wildcat has been termed Canada's biggest discovery of 1958. It is 160 miles northwest of Edmonton.

The staggering 1.5 billion cubic feet per day open-flow potential was calculated on the basis of U. S. Bureau of Mines tests during the last month.

That tops anything in the U. S., which has two wells with open-flow potentials of 1 billion cubic feet per day. One is Humble Oil & Refining Co. 1 Louis M. Gubbels in San Miguel Creek field, McMullen County, Texas. It was completed at 10,149-82 ft. The well was the first deep Edwards production in South Texas.

The other is a Phillips Petroleum Co. well in Puckett field, West Texas. It produces at about 15,000 ft. in the Ellenburger and is Texas' deepest producer.

The A-8 Berland River outstrips Canada's previous largest open-flow potential by more than five times. The previous record holder was the British American-Husky-Phillips-Dick Lake 7-34 in the Dick Lake field of Central Alberta. It was completed with a calculated open-flow potential of 288 million cubic feet per day.

**Other flow figures . . .** Recent production tests at the big well showed the following results:

| | | | | |
|---|---|---|---|---|
| Choke size, in. | 1 | 5/8 | 1/2 | 3/8 |
| Flow rate (million cu. ft. daily) | 44.8 | 29.6 | 21.8 | 12.9 |
| Wellhead pressure (psi.) | 2,491 | 3,469 | 3,754 | 3,936 |

Bottom-hole pressure was 5,294 psi.

**What it means . . .** This discovery climaxes an exploration campaign in western Alberta that during the last 3 years has provided some sensational new discoveries. Prior to that time, the southwestern plains of Alberta was one vast virgin theater, largely inaccessible except during the cold winter freezeup.

But since 1956 new major oil fields have been found, each of which rated headlines. These include Swan Hills, Kaybob, Virginia Hills, Iosegun, and others. At the same time, a sensational chain of prolific gas fields has popped up in the foothills belt. For many years, Pincher Creek was rated as Canada's largest gas field, but in these past 2 years it has been surpassed by Waterton Park and possibly Savanna Creek.

Berland River lies between the foothills belt and the western plains, near the deepest part of the western Canada basin. The finding of such prolific production from the thickest known reef section at depths of 12,000 ft. or more should stimulate a brisk winter-time campaign throughout southwestern Alberta.

It is entirely possible that similar reefing conditions could carry on westward as far as the foothills themselves. So far only one Devonian gas pool has appeared in the foothills. This was Shell Oil Co.'s discovery at Panther River in 1958. This one had flows of more than 7,000 cu. ft. per day from the Devonian as well as Mississippian gas at 12,264 ft.

The first Devonian gas flows came last year at Central Foothills Agreement's 6-4 Lambert Creek where the D-1 section flowed in commercial amounts, but this wildcat was finally abandoned at total depth of 15,195 ft. as Canada's deepest well.

Thus, the Devonian section should lure many new wildcat tests in the

foothills belt and on the western plains. Already, some Canadians predict a possible shortage of deep-drilling equipment next winter.

**Deepest producer . . .** British American found the Leduc or 3-D reef at 12,014 ft. Gross pay thickness is 663 ft., of which 551 ft. is estimated net pay. That is a new record for this kind of find.

The well was drilled to 12,677 ft. and was plugged back to 12,465 ft. Casing was set at 12,008 ft.

At 12,014-12,235 ft., it is the deepest production of any kind in Canada.

British American and Shell drilled the Berland River test on a 400,000-acre reservation shared jointly by the two firms.

## Shell Plans Flood

### in K.M.A. field to recover an extra 2,000,000 bbl.

SHELL OIL CO. and other operators plan to launch a water flood soon in the Zone 11 sand under 1,270 acres of leases in North Texas' big K.M.A. field.

The project is expected to recover well over 2,000,000 bbl. of added oil from the pay.

The acreage lies in the northeastern portion of K.M.A. The first well on these leases was completed in August 1938. Production now is down to a meager 1.4 bbl. daily per well average. Primary depletion is estimated at about 98%.

Shell engineers say the flood pattern will employ irregular 30-acre five spots. The injection system will be of the closed type with the water input rate running about 200 bbl. daily per injection well.

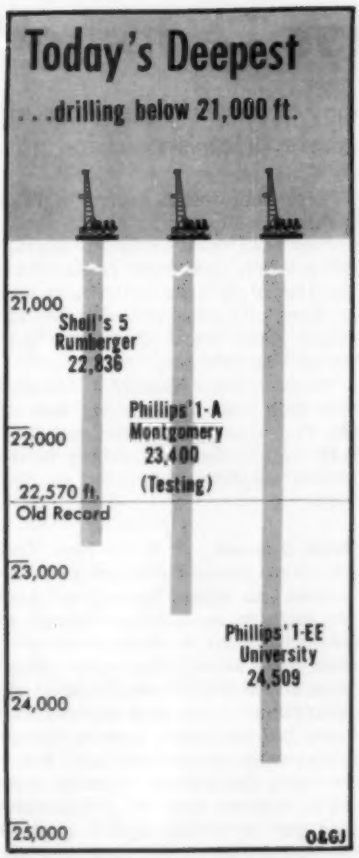
When fully developed, the project will have 30 producing wells and 41 injection wells.

The leases involved in the project were repressured with gas for 17 years between 1940 and 1957. Cumulative production from the leases is about 2,980,000 bbl. Shell estimates original oil in place at 14,894,000 bbl.

**Second operation . . .** This is the second substantial K.M.A flood to be tackled by Shell in the past year.

The first, approved by the commission last May, actually is a unit operation with Shell as operator (OGJ, April 28, p. 73 and May 19, p. 103).

This project, now under development, will flood Zones 1 and 2 under 4,640 acres. It is expected ultimately to produce an extra 15,500,000 bbl. of oil over total primary take.




## Wells Go Deeper

### in Pecos County, Elk City. 1-EE passes 24,500 ft.

TWO of the three world's deepest wells drilled ahead last week, while the third prepared to acidize for testing uphole.

Here is the rundown:

. . . **Phillips Petroleum Co.'s** 1-EE University in Pecos County, Texas, the record holder, went to 24,509 ft. It is looking for the base Ellenburger formation and is projected to 25,000 ft. The bit is still in the Simpson and averaging around 40 ft. per day.

. . . **Phillips' 1-A Montgomery,** which has bottomed at 23,400 ft., was preparing to acidize at 22,600-880 ft. to test a show in the Ellenburger. The well is in Pecos County.

. . . **Shell Oil Co.'s 5** Rumberger in the Elk City, Okla., field, drilled to 22,836 ft., just 81 ft. deeper than the week before.

In another deep well in Pecos County, Phillips prepared to acidize the 1-A Harral, drilled to 19,020 ft. and currently perforated at 16,630-670 ft. Gas flowed at a rate of 1,800,000 cu. ft. per day from the perforated section.

## Industry briefs

**The latest effort to extend Washington** production beyond its present one-well status came a cropper when McCulloch Oil & Exploration Co. of California, Inc., quit its third Kummer anticline test at 5,069 ft. This area is about 1½ miles northwest of Enumclaw and 35 miles south of Seattle.

**Merger of North Star Oil, Ltd., and** Cree Oil of Canada, Ltd., has been approved by the companies' directors. Final approval must come from shareholders. Under the agreement, shareholders would receive one share of North Star for each three shares of Cree.

**Wyoming's largest unit, Meridian** Ridge unit in Lincoln and Sublette counties, has been approved by the U. S. Geological Survey. Carter Oil Co. is operator of the 99,326-acre block. Other interests are held by Mountain Fuel Supply Co., Pan American Petroleum Corp., Gulf Oil Corp., Belfer Natural Gas, Sunray Mid-Continent Oil Co., Superior Oil Co., Continental Oil Co., Skyline Oil Co., and The Texas Co.

**Stockholders of Altex Oils, Ltd.,** will meet September 26 to act on an offer by New Superior Oils of Canada, Ltd., to purchase the assets of Altex. In a proposed stock-exchange deal, Altex stockholders would receive one share of New Superior for each 7½ shares of Altex. The deal would give New Superior net assets of $6,224,000.

**Tidewater Oil Co. brought in its** first triple-zone producer at the 1 State Lease 74, an offshore well in Umbrella Point field, Galveston Bay, Texas. On 3-hour tests, the F-1A zone at 7,697-7,703 ft. made 233 bbl. of oil daily on 9/64-in. choke. The F-5 zone at 8,269-74 ft. flowed 252 bbl. daily on 10/64-in. choke. And the F-15 zone at 9,076-78 ft. tested 280 bbl. daily on 16/64-in. choke.

**The first oil well in Mississippi to** produce from the shallow Sparta (Eocene-Claiborne) formation was completed last week by Germany & Gulmon in the Ellis Cliffs field, south of Natchez, in Adams County, where previous production has been from the deeper Wilcox sands. The new well, 3 Laura Butler, flowed 155 bbl. of 35°-gravity oil per day through 9/64-in. choke with pay at 3,898-3,901 ft.

# Transco Rushes Looping

**. . . project in 10 states in hopes of meeting winter deadline in 2 months. Record offshore price is paid for gas.**

THE LARGEST expansion program in the history of Transcontinental Gas Pipe Line Corp. got started in earnest last week as the company rushed to meet its commitments for increased gas deliveries this winter.

Dirt started to fly in 10 states from Texas to New Jersey almost immediately after the Federal Power Commission issued a certificate for the $167-million construction project.

Contracts for much of the work had been let months ago while Transco was awaiting FPC approval. Necessary pipe had been purchased and stored in temporary yards along the pipeline route. Contractors had hired many men for their construction crews and had moved equipment to the work sites. They were ready to go when the FPC approval came through.

Although the company has a bare 2 months to prepare for the winter heating season in its northern marketing area, Transco President E. Clyde McGraw is confident its commitments will be met.

**The price . . .** FPC not only approved the huge project but also a record price for the gas.

The rates of 22.4 to 23.3 cents per 1,000 cu. ft. are the highest ever granted for Louisiana gas by FPC. Higher rates have been applied for—but not approved.

The rates apply to some 2 trillion cubic feet of gas, to be sold to Transco by 26 independent producers in southern and offshore Louisiana.

The higher rate of 23.3 cents applies to offshore gas. Of this amount, 22 cents is the basic price, while 1 cent is for the state gathering tax and 0.3 cent the state severance tax. The contracts also call for Transco to pay three-fourths of 1 cent of still another 1-cent gathering tax, but FPC did not act on this phase. The newer gathering tax has not yet been upheld in court.

In approving the record rates, the FPC majority rejected a recommendation of its staff that the rates, proposed by the producers, be cut back to the level in the producing area—17 cents.

The commission majority found no evidence to show the proposed rates are unreasonable. Furthermore, it found there is an urgent need for gas, and Transco had warned that a 17-cent limit would prevent it from getting new supplies.

"No basis exists either for denying the producer certificates requested on the ground of price or for attaching to them rate conditions reducing the initial rates below the levels proposed," the FPC said.

Commissioner William R. Connole dissented from the majority view of the five-member commission. Connole argued there is nothing in the record supporting prices up to 23.3 cents.

**What it means . . .** In the New York City-New Jersey-Philadelphia metropolitan area alone, Transco will have an increase in daily allocations of 190,000,000 cu. ft. of gas this winter. This area already has daily allocations of 669,000,000 cu. ft. plus 136,000,000 cu. ft. on peak-demand days from the company's present storage.

The entire project will boost Transco's peak-day delivery capacity about 40%, to more than 1½ billion cubic feet per day (OGJ, Apr. 7, p. 108). However, part of the expansion—including some of the proposed offshore lines—likely will not be completed until next year.

A major portion of the current expansion will involve 204 miles of 36-in. and 106 miles of 30-in. loops along the company's main line, which stretches from South Texas to New York.

The project will complete looping of the system from the natural-gas supply areas along the Gulf Coast all the way to the New York area. In recent years the main line had been looped from Louisiana eastward, except for scattered segments totaling about 232 miles in length.

**Who's doing work . . .** Bechtel Corp. has the contract to lay 8 miles of 30-in. and 63 miles of 36-in. loops in Pennsylvania and New Jersey and an additional 55 miles of 36-in. in Alabama, Georgia, and South Carolina. J. P. Neill & Co. will lay about 11 miles of 30-in. and 57 miles of 36-in. loops in North Carolina and Virginia.

Bechtel and Neill were both on the job last week. Remainder of the looping was to be started immediately by Sharman, Allen, Gay & Taylor, Inc. Its contracts cover about 87 miles of 30-in. and 28 miles of 36-in. loops, all in Texas, Louisiana, and Mississippi.

Construction also has started on 192 miles of 24-in. and 30-in. line from the Leidy storage field in north central Pennsylvania to the main system in New Jersey. Panama-Williams Corp. has the contract for approximately the eastern two-thirds of this project, with Sharman, Allen, Gay & Taylor doing the remainder.

Completion of the "Leidy loop," as this phase of the project is called, will increase storage capacity from the present 136,000,000 cu. ft. per day to 340,000,000.

Overall, the daily allocated capacity of Transco's main line will be increased from 953,000,000 to 1,191,000,000 cu. ft. This volume, together with gas storage, will give Transco a peak-day delivery capacity of 1,531,000,000 cu. ft.

Another major phase of the expansion is a proposed 24-in. purchase lateral extending south from the Louisiana-Mississippi state border. It will branch into numerous smaller lines which will connect with onshore and offshore fields. Inland portion of the new supply lateral will be about 151 miles in length. Offshore plans call for a network of some 147 miles.

The approved plans call for addition of more than 48,000 hp. at new and existing compressor stations.

# PROCESSING

**Synthetic rubber has moved in on** natural's last position—tire treads. According to Phillips Petroleum Co., a new cis-polybutadiene called "Cis-4" has consistently outperformed natural rubber, giving 30 to 40% longer tread wear in heavyduty truck operation. The new synthetic also generates less heat than natural rubber. This new breakthrough looks promising because the new rubber is made from relatively low-cost butadiene which is readily available.

**Completion is scheduled October 1** of a 5,400-bbl. catalytic-reforming unit at the Moose Jaw refinery of British American Oil Co., Ltd. The unit will not increase the total capacity of the refinery but will upgrade gasoline already being produced.

**Petroleum Chemicals, Inc., New** Orleans, is expanding its research into the manufacture of new chemicals from petroleum. The company is organizing a development department

# Pin-Point Heat Warms Oil Zone

GAS-FIRED bottom-hole heaters are the latest method being tried in California fields for stimulating the output of low-volume, heavy-oil wells.

Natural gas or propane is burned in a heater suspended in the well fluid opposite the producing zone. Since almost all heat is passed into the fluid or formation and little is wasted on up-the-hole heating, fuel requirements are minimized.

The new heater, developed by California Research Corp., has been field tested in six Southern California wells since 1955. Before being given the hot-foot, the wells were averaging 15 bbl. daily. Heated, their combined oil output jumped from 90 bbl. daily to about 100 bbl. daily. They still are being heated with very favorable results and with a minimum of service.

**How it works . . .** The 4-ft. long burner section is run in a well on 1¼-in. pipe.

Compressed air and gas, mixed to the proper proportion in a small-volume tank, are injected down the pipe. A wire-line spark igniter is used to start the gas burning. Combustion gases are exhausted into the formation through a check valve below the heater.

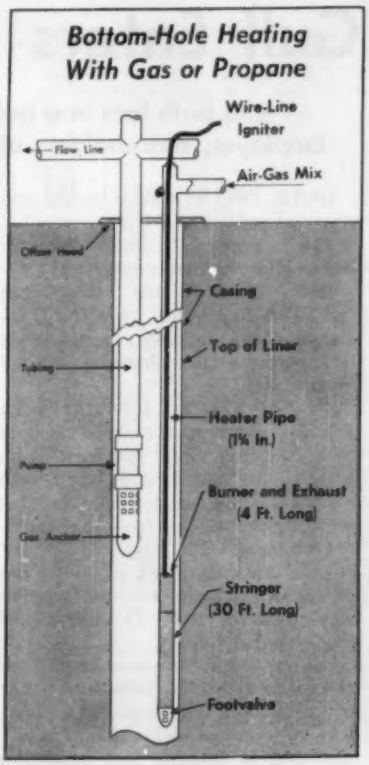
Economy of operation is the principle feature of the new heater, which is being manufactured by Fran-Well Heater Co., Bakersfield. Where field gas is burned, the heater can supply 40,000 B.t.u. of subsurface heat per hour for less than 50 cents daily. Tests showed it will operate for less than $1.50 daily if propane is used as fuel.

When bottom-hole heating is performed by electrical resistance heaters or by hot-water circulating units, average fuel cost for California wells has been about $2 per day. In the latter case the relatively high cost is due to large up-the-hole heat losses. High power costs make electrical heating expensive.

**In a lull . . .** The bottom-hole heating business in California currently is suffering from an excess of supply.

With hundreds of low-gravity wells shut in and the output of many more curtailed because of lack of a market, there is little incentive for an operator to stimulate his wells.

But the method has gained wide acceptance in the past 3 years. An estimated 1,200 wells, mostly in San Joaquin Valley fields, now have heaters installed. The method has not worked in all wells, but where conditions were right, bottom-hole heating resulted in about a 10-bbl. increase in oil production.




# BRIEFS . . .

with three divisions—research, projects analysis, and market analysis. Dr. Howard L. Malakoff, head of the technical department, will be in charge of the development department.

**Canadian Kellogg Co., Ltd., has** been awarded a $2.5-million contract for a Powerformer at the Imperial Oil, Ltd., refinery at Regina. Construction will start in October and be completed in September 1959. The unit will have a 3,000-bbl. capacity but will not change the refinery's present over-all 22,500-bbl. capacity.

**Chemische Werke Huels, A. G., at** Marl, West Germany, has placed on stream a new Houdry Dehydrogenation process unit, designed to produce 36,000 metric tons per year of butadiene for synthetic rubber. Houdry handled process design, and Chemische Werke Huels managed construction.

**Standard Oil Co. (N. J.) is prepar**ing its marketing companies for the commercial jet age. A 3-week training institute is being held at the Esso research center in New Jersey on fuel, lubrication, and intoplane servicing requirements of turboprop and jet aircraft. The institute includes lectures, laboratory demonstrations, and visits to aircraft and engine manufacturing plants (See related story on p. 101).

**Gulf Oil Corp., Pittsburgh, has de**veloped a new railroad car lubricant. The lithium soap-base grease is available under the name "Gulfcrown RR." Officials said the lubricant was approved after testing by the Association of America Railroads.

**The first bulk shipment of acrylo**nitrile ever transported by ocean tanker from the U. S. has arrived at Coleraine in Northern Ireland. Other shipments will be made by Monsanto Chemical Co.

The shipment of 1,000 metric tons of the chemical left Monsanto's Texas City plant last May aboard a 14,000-ton tanker. It was unloaded at Rotterdam, and then shipped to the Coleraine plant of Chemstrand, Ltd., aboard a 500-ton tanker.

## Also for Refiners . . .

**IN THE NEWS:** Volumes of kerosine needed in early stages of jet-age are trimmed downward (p. 101) . . . Government's new import plan will shift quotas to refinery-run basis (p. 104) . . . Company reaction to import plan generally favorable (p. 105) . . . A new molecular-sieve process upgrades gasoline (p. 115) . . . Paraffins are now being used to produce detergents with Cobalt-60 (p. 115).

**PLUS THESE TECHNICAL REPORTS:** Photographs of scale models speed process-unit design (p. 222) . . . The Refiner's Notebook (p. 243) . . . Process Costimating (p. 244).

# Gulf Enters Politics

## . . . with both feet in a bold precedent for oil companies. Employes, shareholders urged to "become more active."

GULF OIL CORP. is going into practical politics—in a big way.

The company names organized labor as its chief adversary.

Gulf charges that labor has "achieved dominance" over the U. S. Congress by organized campaign effort and that U. S. business has not fought back.

"If we are to survive, labor's political power must now be opposed by a matching force, and there is no place in the United States where such a force can be generated except among the corporations that make up American business," Gulf says.

In a crackling letter to Gulf's employes and shareholders, Gulf's senior vice president, Archie D. Gray, draws the issue this way:

"If our free, competitive institutions are to be preserved from destruction by the unholy combination of predatory gangsterism and crackpot socialism that is thriving and expanding under labor's Congressional benevolence, then business has no choice. It must do likewise, or throw in the towel."

**Archie D. Gray**
". . . Start swimming or drown."

**The program . . .** The immediate target of Gulf is Congress.

Recognizing that time is short for its program to have much effect on the upcoming elections in November, Gulf nonetheless will make an effort to influence the outcome.

"Even without a properly prepared program there is much that each of us, acting as individuals, may do in this election year," Gray said.

He called on employes and shareholders to make a "real electioneering effort" and ask friends and associates to do the same.

Primarily, however, Gulf is looking far beyond the November elections because an active political program "needs long and careful planning."

The company, which has had the idea under consideration for at least a year, is not ready to lay down a detailed plan of action, but initially it will encourage its 161,000 employes, shareholders, and dealers "to become more active participants in the politics of the area in which they live."

Gulf will make a "continuous study of the official behavior of elected officials," starting with members of the U. S. Senate and House.

"This information will be distributed by states and Congressional districts to serve, in each area, as a nucleus of fact around which a program of action may be developed," Gray said.

"Naturally it will take time to bring such a program to a level of maximum usefulness, too long a time, in fact, for much to be done in the 1958 elections. This is unfortunate, but it cannot be helped. So much is at stake that it would be foolhardy to proceed with anything less than the most careful preparation."

**What prompted it . . .** Gulf's aggressive march into the battlefield of practical politics represents a new approach to public life for a major oil company.

Explaining its decision, the company quotes at length from Rep. Ralph W. Gwinn (R-N.Y.), who recently wrote his constituents that top officials of organized labor "dominate Congress."

Gulf quotes Gwinn: "Over 175 members of the house have benefited from union contributions, free campaign help, radio and TV time, advertising, extensive publicity in the labor press, scores of voluntary workers furnished by the unions, doorbell ringers, telephone brigades, and all the rest of it. Business organizations do none of this. Business as such is unorganized politically and therefore impotent."

Gulf calls Gwinn's statement "an impelling call to action" and adds: "Whether we want to be there or not, Gulf and every other American corporation is in politics, up to its ears in politics. We must either start swimming, or drown."

Gray's letter has been printed in the new issue of Gulf's company publication, The Orange Disc, and readers were asked to forward it to Senate and House candidates in their areas. Gulf is providing extra copies to those mailing requests to its public-relations department at Pittsburgh.

# High Gubik Offers

## total $224,000. Awards to follow study of all bids.

THE GOVERNMENT stands to net almost $224,000 in bonus money if all high bidders are granted leases in Alaska's Gubik gas field.

The Interior Department is studying the 47 offers received in the first competitive sale of Alaskan leases (OGJ, Sept. 8, p. 68).

Top bid was $103 per acre, a total of $65,920, for the northeast quarter of Block 6, Range 3 E. It was submitted by E. B. Towne, Jr., San Francisco, who also offered the second highest bonus of $46.88 per acre, a total of $30,003.20, for the southwest quarter of Block 1, Range 3 E.

Towne's bids were not included in the original list of offers because the tracts were not sufficiently identified at the time of bid opening.

Other high bids in the sale ranged from $3.11 an acre to $15.27 an acre. Department officials expressed satisfaction with the opening, pointing out there was at least one bid for each of the 26 tracts.

**Drilling near . . .** Alaska Consolidated Oil Co. is moving in a rig to start drilling a wildcat on a 51,000-acre tract recently purchased from Havenstrite Oil Co., Los Angeles, on the west shore of Cook Inlet across from the Kenai Peninsula.

Alaska Consolidated's test will be drilled near a 9,745-ft. wildcat abandoned several years ago by Havenstrite. The Havenstrite test reported some shows but nothing commercial.

Coastal Drilling Co., Bakersfield, has the contract. Coastal also is doing the work on Standard Oil Co. of California's latest try to extend the Swanson River field on Kenai.

**Other activity . . .** Six more oil firms joined the Alaskan land rush by acquiring leases or lease options jointly on 906,240 acres in three widely scattered areas.

The six companies are based in

Tulsa. They are Blackwell Oil & Gas Co., White Eagle International Oil Co., Texas Natural Gasoline Corp., Crescent Corp., and Western Hemisphere Petroleum Corp., each with 17.8% interest, and Apache Oil Corp. with 11% interest.

The land includes 401,920 acres in the Yukon-Koyukuk Cretaceous basin in west central Alaska, 302,080 acres in the Kandik basin near the Canadian border in east central Alaska, and 202,240 acres in the Bristol Bay area of southwestern Alaska.

Operator of the proposed unit operation has not been selected yet, but Blackwell has been acting as temporary operator. Geological work will begin in 1960 at the latest.

## CATC Hits 42 Miles Offshore

THE CATC Group has discovered oil 42 miles off the Louisiana coast on its most expensive offshore acreage.

The discovery is in Block 208, Eugene Island area, more than 5 miles southwest of nearest production. The well is the farthest offshore of any producing oil well off Louisiana.

On a 4-hr. test, the well flowed at the daily rate of 269 bbl. of 37.3°-gravity oil and 250,000 cu. ft. of gas, according to Continental Oil Co., operator for the four-company group. Production is from perforations at 8,879-85 ft., with the flow being gaged through a ⅛-in. choke. Gas-oil ratio was 929 to 1. Projected to 14,000 ft. the test was bottomed at 9,612 ft. in salt.

The CATC Group paid bonuses of more than $9.4 million in 1955 for two leases covering the 5,000-acre block. Associated with Conoco in the CATC Group are Atlantic Refining Co., Tidewater Oil Co., and Cities Service Production Co.

## Mississippi Test Hits

MISSISSIPPI'S fourth deep Lower Cretaceous field to be discovered this year came in last week.

Its discovery well, located 12 miles northeast of Laurel, in Jones County, is a joint operation of Central Oil Co., Lone Star Producing Co., and Jett Drilling Co.

Production is from the Bailey (Sligo) sand at 10,710-14 ft. from which the well is flowing 10 bbl. of 33°-gravity oil per hour through ¼-in. choke. Location is on the Bolton-Soso-Citronelle trend of fields. It is 6 miles from the nearest other Lower Cretaceous production, but 20 miles from the nearest production from the Bailey zone.

# The JOURNAL Said . . .

## 50 years ago

September 20, 1908

**Some interesting figures are at hand** bearing on the present state of activity in the Glenn field as well as its vitality and longevity.

The daily production for August 1908, was 47,421 bbl., while that for the same month a year ago was 122,900 bbl., a decrease of 75,479 bbl. The average per well in August 1908, was 35 bbl. The average per well for August 1907, was 172 bbl. These are big declines, but it must be remembered that a year ago nearly all the wells were flowing naturally. Now practically all of them are on the pump.

**The Frisco is preparing to oil its roadbed** between Beaumont and Houston and proposes to use oil also for fuel on its passenger locomotives over the same route.

## 25 years ago

September 14, 1933

**Highly significant is the fact that the** Tomball area in Harris County, Texas, appears to be out of consideration as a prospective great oil field. It is called the biggest disappointment in the history of Gulf Coastal exploration.

**The price-fixing section will remain in the** oil industry code as signed by the President, but it will be inoperative until it is seen whether the balancing of supply with demand will adjust prices on a reasonable level.

**Appointment of Alexander Fraser as** president of Shell Petroleum Corp. and its affiliated companies is announced . . . Mr. Fraser succeeds R. G. A. van der Woude, who has been transferred to New York in an executive capacity with Shell Union Oil Corp.

## 10 years ago

September 16, 1948

**Most car manufacturers have indicated** that they desire to make further increases in their engine compression ratios from the present average of about 6.5 to 1. At least one manufacturer has made successful tests using an engine with a compression ratio of 12.5 to 1, with claims of up to 40% in economy with suitable fuels of 100 to 105-octane ratings.

**On August 1, Old Ocean field of Brazoria** and Matagorda counties, Texas Gulf Coast, began operation under a unit agreement, thus becoming the largest voluntarily unitized oil and gas field in the United States.

Engineers estimate that over 78,000,000 additional barrels of oil and condensate, plus about 200,000 bbl. per year of plant products will be recovered as a result of unitization.

**Climaxing an unruly career that began** when it blew wild on May 12, Atlantic 3, LSD 12, 23-50-26w4, the most spectacular well in the Leduc field, caught fire on September 6 and burned wide open with gas and oil flames leaping 200 ft. in the air.

On September 9, the fire was reported extinguished, the injection of water choking off the oil and gas. At its peak the wild well is estimated to have flowed 14,000 bbl. a day . . . The well has marketed approximately 1,200,000 bbl. of oil, in addition to undetermined quantities lost.

# Changes in Autos May Jar Oil

DEVELOPMENTS in automobile engines and transmissions will have a profound effect on future operations and economics of the oil industry, a Chrysler Corp. executive warned last week.

Paul C. Ackerman, Chrysler's engineering vice president, in a speech before the National Petroleum Association meeting in Atlantic City, outlined these changes:

. . . **Aluminum engines.** Development has reached a point where manufacturers soon will be able to choose between aluminum and conventional engines. Use of aluminum will mean better fuel economy.

. . . **Combined transmissions and rear axles.** Since transmission lubes are not right for rear-axle gears, development of a lube that is compatible with both is needed to make this much talked of development possible.

. . . **Gas-turbine engines.** This revolutionary change is not too far away.

**Turbine outlook . . .** Many engineering and production problems still must be solved before the gas turbine is ready for public sale.

But Ackerman declared, "I can tell you that we are rapidly approaching the time when our experimental turbine cars will be superior in fuel economy, mechanical reliability, and vibration-free operation to any piston engine we can foresee."

"In the one respect it has lagged—acceleration—it promises ultimately to be fully competitive," Ackerman said.

The Chrysler executive explained the gas-turbine engine would be a boon to the motoring public. It would mean an engine with one-fifth the parts of today's piston engine, with virtually no vibration, with no octane rating needed for its fuel.

The gas-turbine engine, however, would present both problems and opportunities to the oil industry, Ackerman declared, explaining: "It will use any fuel that will burn and flow through a pipe. What this may mean to the economics of your business is for you to judge."

# Cycling Plant Planned

## . . . by Humble on King Ranch. Huge plant would process gas from 24 fields in three counties. Early approval seen.

HUMBLE OIL & Refining Co. last week presented plans for a huge South Texas cycling project to the Texas Railroad Commission in Austin for its approval.

A commission green light is expected in short order.

Humble plans to build one big plant to cycle the gas caps of 24 separate reservoirs in four fields in three counties.

The cycling plant, together with gathering system and a large-diameter pipeline to the upper Texas Gulf Coast, add up to a multimillion-dollar project.

The fields involved are Borregos, Seeligson, Tijerina-Canales-Blucher, and Stratton in the King Ranch area of Nueces, Kleberg, and Jim Wells counties.

The new plant—to be known as the King Ranch plant—will be erected in the Seeligson area and designed to handle 300,000,000 cu. ft. of gas daily. Humble expects to complete it and get the cycling program fully developed in 1960.

**Boost in recovery . . .** The company estimates the program will hike the total take of hydrocarbons from the involved reservoirs by roughly 23,000,000 bbl.

Recovery of the extra liquids would stem from prevention, by cycling, of retrograde losses of gas-cap liquids that would otherwise occur in future years with dropping reservoir pressures.

Humble's Larry Rawl, district engineer at Stratton, told the commission that the gas caps of the 24 pools have liquid contents ranging from 17 to 35 bbl. per M.M.c.f. of gas.

The cycling program, he said, would be designed for each reservoir so that it would not interfere with oil production or decrease ultimate oil take.

Liquid losses due to retrograde condensation so far have been minor, Rawls said, due to efficient production practices.

The Humble engineer said the company expects oil-depletion operations in the reservoirs to continue for a period of 25 to 50 years due to the pressure-maintenance effects of the large gas caps. Without cycling, there would be some retrograde losses during this period.

But the major loss would come after oil operations ceased and gas cap production started. Cycling at this time would not completely prevent retrograde losses. And it could not be justified economically, Rawls said, because it would delay the sale of gas by 20 years or more.

**50 miles of lines . . .** Humble expects to lay about 20 miles of injection lines and 30 miles of gathering lines to handle the gas.

The lines will connect about 56 injection wells and 86 producing wells to the King Ranch plant.

Cycling of 2 of the 24 reservoirs, the R-13 in Borregos field and the L-4 Soze in Stratton, will begin prior to final completion of the plant in 1960. The other 22 will be brought in as soon as the plant goes into full operation.

These are: The F-5, J-3, I-5, and I-9 and 11, N-4, 5, 6, and 7, N-17, N-21, N-23, N-25, R-3 and 4, and R-7 in Borregos field; the 21-B and 21-D reservoirs in Seeligson; the No. 2, No. 3, and No. 7 Tijerina reservoirs in Tijerina-Canales-Blucher; and the Sellers 3, Sellers 4, R-2, R-3, and R-13 in Stratton field.

Humble drew support for its application from Sun Oil Co., Magnolia Petroleum Co., and Sunray Mid-Continent Oil Co.

# Pipeline Endorsed?

## Rumor says Borden group to urge crude line to Montreal.

THE CANADIAN oil industry was buzzing last week with a report that the Borden Commission will endorse a big-inch crude line to Montreal.

Speculation was rife that the commission will recommend government sanction of the proposed line to move Alberta crude to the East Coast.

The commission's interim report is to be submitted to federal authorities in October. It is also expected to suggest government action to permit export of natural gas from Western Canada to the United States.

During its hearings across Canada, the commission heard a minority group of western producers argue that construction of the crude line would be an economic venture which would provide an outlet for western surpluses.

Major companies argued just as strenuously that the line would not be economic and, among many repercussions, would boost the price of oil and petroleum products to consumers in the Montreal area.

Arguments for construction of the line have been strengthened by cuts in U. S. imports of Canadian crude. The newest U. S. imports-control plan, announced last week, is expected to swing further support to the proposal.

## Gas Well Sets a Record

DEEPEST well ever drilled in the search for gas in New York and Pennsylvania currently is being drilled for New York State Natural Gas Corp.

The well, located in Woodhull Township, Steuben County, New York, has reached depth of 12,415 ft. Previous record was 12,343 ft. for a well in Sullivan County, Pennsylvania.

Delta Drilling Co., Tyler, Tex., is the contractor. Using rotary equipment, crews removed cuttings with air or gas to a depth of 11,993 ft. Then mud was substituted.

New York Natural also holds the record for the deepest well ever drilled with cable tools. It was the 1 C. Kesselring drilled to total depth of 11,145 ft. in Van Etten Township, Chemung County, New York, in 1953.

# U. S. Studies Oil

## situation as basic step to writing long-range policy.

ABILITY of the domestic oil industry to meet future needs in peace or war is being assessed by the Government.

The Bureau of Mines is making surveys in the field of our crude reserves and availability, now and at various times up to 1975.

The survey is part of a program to reassess the resources and transportability of crude and products and of requirements under various condition, including an attack on the continental U. S.

The purpose of the work is to provide a basis for the writing of a long-range national policy. The need for such a policy has been urged periodically over a number of years, both in and out of Congress.

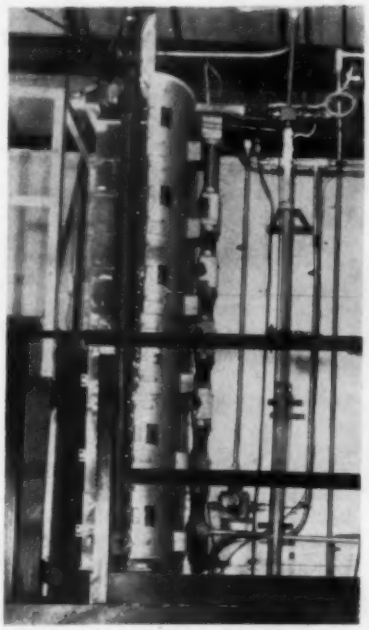
The bureau has called in some 50 staff people to go into the offices of producing companies for first-hand figures on current reserves, etc., and estimates of future availability. One of the subjects to be studied is the effect on discovery and development by different future price levels.

# Finishing Process Looks Good

PILOT-PLANT studies indicate that gasoline can be upgraded by a new selective finishing process in which paraffins are removed from a gasoline stream by molecular sieves. This increases both octane number and sensitivity of the stream and enhances its value as a blending stock for premium motor fuel.

The new process was announced in Chicago last week by Bruce S. Bailey and Norman Albert, Texaco Research Center, Beacon, N. Y., at the annual meeting of the American Chemical Society.

Their experimental work has resulted in this new patented processing technique, known as Texaco Selective Finishing Process (TSF).



SIEVE section of pilot plant.

**Versatile process . . .** A wide variety of stocks may be upgraded.

As shown in the table, cat-cracked naphthas, thermal-cracked naphthas, straight-run naphthas, and catalytic reformates show good response.

Light straight-run naphtha and light catalytic reformed gasoline are particularly susceptible to this upgrading. Removal of low-octane normal paraffins from light paraffinic stocks leaves monomethyl and dimethyl branched paraffins which are particularly valuable in the manufacture of premium gasoline.

Blends containing TSF-treated stocks also show good road performance. And by selective blending, using treated straight-run or treated light reformate where possible, a healthy increase in road rating can be achieved. For example, replacing light catalytic-cracked naphtha with TSF-treated light catalytic reformate results in an increase of two to three road octane numbers.

The authors also feel it will be practical to use TSF-treated stocks to reduce the amount of alkylate now needed to decrease sensitivity. If a paraffinic pot, or blending stream, of 98 octane number is required to meet a specific blending need, it may be made by mixing 65% alkylate and 35% light straight run. If TSF-treated light naphtha is substituted for straight run, only 15% alkylate is needed in the pot.

**How it works . . .** The molecular sieves used in the separation are dehydrated zeolitic minerals which pick up other molecules to replace the lost water of hydration.

The dehydrated minerals have pores of uniform size. And the pore size governs the size of molecule which can be picked up on the sorption process. Texaco uses sieves which would pick up straight-chain molecules, while rejecting branched-chain isomers, naphthenes, and aromatics.

The process provides for regenation of the sieves to recover the straight-chain molecules. When sorption takes place at low temperature, regeneration is accomplished by raising the temperature and purging. If the process is operated at elevated temperatures and pressures, desorption is carried out by depressuring and purging at process temperature.

**OCTANE UPGRADING BY TSF PROCESS**

| | Research octane number | | | |
|---|---|---|---|---|
| | Charge | | Product | |
| | Clear | 3 TEL | Clear | 3 TEL |
| Cat-cracked naphtha | 88.0 | 94.0 | 94.4 | 98.8 |
| Thermal-cracked naphtha | 76.0 | 89.1 | 88.5 | 96.1 |
| Light straight-run naphtha | 68.9 | 85.5 | 84.3 | 96.6 |
| Catalytic reformate | 87.1 | 97.1 | 95.3 | 101.1 |
| Light catalytic reformate | 74.1 | 92.3 | 85.7 | 98.2 |

# New Red Earth Pay

## found by Union opens up vast area to Slave Point testing.

A VAST new area of northern Alberta has been opened up to the possibility of Middle Devonian production.

Union Oil Co. of California brought this prospect to famous Red Earth Creek field last week. The field's production previously has been all in the granite wash.

But Union's 4-20-88-8 Red Earth Creek got 1,410 ft. of clean oil on a drill-stem test of the Slave Point Middle Devonian.

The Slave Point is the famed pay sand of Swan Hills field, 114 miles south of Red Earth and the only Middle Devonian field in Canada. Union's wildcat, if it proves a commercial producer, will open this pay to further wildcatting from Swan Hills north to the muskeg.

Union slated its Red Earth Creek well as a regular field test. Drillers found water in the granite wash, however, and decided to test the Slave Point, where the oil show was uncovered.

# Paraffins Used

## in producing detergents with Cobalt-60 source.

ESSO Research & Engineering Co. reports gamma radiation is being successfully used to produce detergents on an experimental basis.

Significantly, feed stock for the process consists of liquid paraffins. By this approach, Esso hopes to come up with an inexpensive line of detergents, cheaper than those produced using the more costly aromatics in their feed.

The new process is called "Sulfoxidation," Dr. James F. Black and Dr. Edmund F. Baxter, Jr., reported in an article prepared for the United Nations International Conference on Peaceful Uses of Atomic Energy, Geneva.

In the radiation experiments, gamma rays emitted by Cobalt-60 caused the reaction of sulfur dioxide and oxygen with liquid paraffins. The result was new classes of detergent materials.

Cost of using radiation in the process is not significant because radiation is required only to start up the reaction. Once the chemical reaction is triggered, the radioisotope can be removed and returned to its storage cell.

# Boundary Dispute Flares

**. . . at hearings to determine how large a region will get repressuring treatment to stop Wilmington field sinking.**

A MAJOR dispute has erupted among oil operators over how much of the Long Beach area should be repressured in a move to save sinking Wilmington field.

The split in ranks of operators came to light at a recent 3-day hearing by the state oil and gas supervisor. He had asked for evidence regarding the field's boundaries.

Opposing testimony asked that the boundaries be:

. . . **Extended** all the way from the Los Angeles Harbor area south to the Orange County line. That's a distance of about 20 miles. It includes Monterey Oil Co.'s offshore island at Seal Beach and the 5-mile undeveloped stretch between there and Wilmington field as it is now designated.

. . . **Restricted** to as small a part of Wilmington field as possible. This group asked that the boundary specifically exclude Monterey's production as well as Fault Block 1 in the main area of the field.

The boundary hassle developed because of a new California law which empowers the oil and gas supervisor to order compulsory unitization of subsiding areas. The first step under the new law, however, calls for him to determine boundaries to be included in any unit plan.

**The opponents . . .** The move for a large unit including Seal Beach was supported by Richfield Oil Corp., the city of Long Beach, and Long Beach civic groups.

The restricted view found support from the city of Los Angeles, Monterey, the State Lands Commission, and several independent-producer groups.

The Richfield-Long Beach position is this: Any effective repressuring program will have to include Monterey's properties as well as Fault Block 1.

Speaking for Richfield, R. W. Ragland, vice president, told State Oil and Gas Supervisor E. H. Musser that it is the consensus of the experts that the Monterey Island production is part and parcel of Wilmington field.

He urged that electric logs be subpoenaed from Monterey to determine whether the island operation is in the field.

Long Beach spokesmen supported the Richfield view. They pointed to engineering reports as upholding the contention that the Seal Beach zones have the same geological characteristics as the subsiding areas of Wilmington field.

Speaking for Monterey, however, Marshall C. Turner, California division manager, said "it is wholly unjust, unfair, arbitrary, capricious, and unreasonable" to include the island operation in the subsidence boundaries.

He contended the intervening 5 miles is broken by faults.

**Trouble at other end . . .** At the opposite end of the field, another fight developed over whether Fault Block I should be included in the boundaries.

Both Long Beach and Union Pacific Railroad, a major operator at Wilmington, contended that pilot floods indicate communication between Fault Block I and the rest of the field. This means it should be included in any field-wide repressuring program.

Not so, said spokesmen for the Los Angeles Harbor Department, Atlantic Oil Co., and the California Independent Oil Producers Association. Both Atlantic and Los Angeles representatives testified subsidence in the Fault Block I has been very small. It constitutes no danger from inundation by the sea nor would any elaborate and expensive repairs be added to facilities in the area.

**Outsiders speak up . . .** Two groups outside the oil industry were heard. They took a different tack in the matter.

Speaking for the Long Beach Chamber of Commerce, President John E. Bilby expressed concern for the safety of 6,500 Long Beach Naval Shipyard workers from the threat of drowning if a dike should break in the area. He urged the boundaries be set to include the entire shoreline at Long Beach from the main area to Seal Beach.

A spokesman for the Marina Improvement Association took a similar view. He expressed concern that unless the entire waterfront area of Long Beach was included the inland residents would be in constant danger from the sea.

**Agree on something . . .** No one argued about the need to include Fault Blocks II and III in any subsidence-area boundaries.

These sections have experienced the severest sinking and include the vast Long Beach Naval Shipyard. Some parts of these areas have subsided as much as 24 ft. since 1941, testimony revealed.

A. C. Zubietta, general counsel for Union Pacific, told the supervisor a unit agreement already had been signed in principal by producers representing 95% of the production in Fault Blocks II and III for a crash repressuring program.

He said the group was now injecting 924,000 gal. of water into the two fault blocks and would soon step it up to 16,000,000 gal. daily.

At the conclusion of the 3-day hear-

# PIPELINE BRIEFS . . .

**Sinclair Pipe Line Co. is nearing** completion of a 60-mile, 12-in. line from Wichita Falls to Jacksboro, Tex., which will permit increased crude shipments to the Gulf Coast in an emergency. H. B. May, pipeline contractor of Wichita Falls, has the contract. Construction is to wind up around October 1.

Sinclair had planned the line for 1959 or 1960, but went ahead on a "crash" basis this summer when Middle East events posed a threat to international oil supply. It will enable 43,000 bbl. daily of West Texas and New Mexico crude to be diverted from the usual northern destinations to tidewater through a new big-inch line from Jacksboro to Houston.

**Two refiners have competing applications** before the North Dakota Public Service Commission to build gathering lines in Newburg pool in Bottineau County. International Refineries, Inc., Minneapolis, and Northwestern Refining Co., St. Paul Park, Minn., both propose gathering systems. They already purchase in the pool and truck oil to the Great Northern railroad at Newburg, which would be the pipeline terminus. The line would cost $250,000 to $300,000. Bottineau Pipeline Co. and Cardinal Drilling Co. have withdrawn similar pipeline applications.

**Michigan-Wisconsin Pipe Line Co.** started construction last week on a gathering system and trunk line to take gas from Laverne field, northwestern Oklahoma. Brodie Construction Co., Amarillo, has the prime contract for building a 56-mile, 20-in.

ing, the supervisor said he would probably make his boundary decision within 2 weeks.

Meanwhile, operators in the field are getting set for the October 6 heading in Los Angeles Federal Court on the Government's suit on behalf of the Navy to shut down the field and sue all producers for multimillion dollar damages. The Government will seek a preliminary injunction to compel repressuring or stop production if nothing is done within 60 days on the repressuring.

## Fire Flood Okayed

### by Railroad Commission on a 5-acre lease in Texas.

JOHN H. DEFORD, Abilene, Tex., independent operator, last week got a Texas Railroad Commission permit to carry out a pilot "fire flood" on a West Central Texas lease.

Deford plans to test the thermal recovery process in a 5-acre, five-spot in the Amerada sand at 200 ft. under his E. E. Knight lease in Coleman County Regular field, Coleman County.

Wallace L. Hammer, consulting engineer for Deford on the project, says plans are to inject and fire air through the four corner input wells then support combustion with further air injection.

The Amerada sand in the area has an average effective thickness of 18 ft. Hammer said average permeability is 653 md. and average porosity about 24.4%.

## Gas Turbine Powers Futuristic Firebird III

NEW INTEREST in the future of the gas turbine will be sparked by Firebird III, General Motors' latest experimental car.

It's a dual-engine job using an aluminum piston engine to drive accessories—and a 225-hp. gas turbine for motive power.

The new regenerative gas turbine, GM says, is 10% more powerful and consumes 25% less fuel than the unit which powered Firebird II. The two-cylinder accessory drive has an 11:1 compression ratio.

Two passengers sit in twin bubbles. Between them is a central "Unicontrol" stick which combines all steering, braking, accelerating, and parking functions. Pressing an Autoguide button turns control over to instruments which will follow a low frequency-powered cable in the highway. A third electronic control sets a constant road speed.

The air-oil suspension system reduces pitching on bumpy roads. Temperature in the passenger compartment is electronically controlled. An ultra-sonic key opens the gull-wing doors by remote control. The car weighs 5,275 lb., including the 600-lb. turbine.

---

line from the field to the company's main line. Brodie also will build field lines, including 33 miles of 4 and 6-in., 7 miles of 8-in., 4 miles of 10-in., and 2 miles of 12-in.

W. E. Chester is spread superintendent on the main line and E. A. Lowe on the gathering-system spread. Coating was subcontracted to Secrest Pipe Coating Co., Tulsa. Crossings of the Beaver and Cimarron rivers and Kiowa Creek were subbed to Burnnie R. Wehmeir, Tulsa.

**Work has been completed ahead of** schedule on the $7-million extension of Westcoast Transmission Co., Ltd.'s natural-gas-gathering system northwest of Fort St. John, B. C. The 84-mile extension will go into operation this month.

The new lines will tie in 21 more gas wells to Westcoast's grid which terminates at Taylor. That will mean delivery of 80 million cubic feet a day more gas to the McMahon plant at Taylor. Ultimately, the extension will add 150 million cubic feet a day to the gathering system's capacity.

**The latest edition of the Federal** Power Commission's map of major natural gas pipelines in the U. S. is now available. It shows major existing pipelines, those authorized or under construction, and proposed lines pending commission action. Copies of the map may be purchased for 25 cents from the FPC, Washington 25, D. C. The order number is FPC-M-52.

**Deliveries of crude oil through** Trans Mountain Oil Pipe Line Co.'s system in British Columbia are expected to average 60,000 bbl. daily this month. Deliveries during August averaged 75,674 bbl. per day.

### *Also for Pipeliners . . .*

**IN THE NEWS:** Transco starts big looping project on its gas line to Northeast market (p. 110).

A complete list of pipeline projects is published the last issue of each month. New jobs and contracts are reported each week in Pipeline Briefs.

**PLUS THESE TECHNICAL REPORTS:** TGT sets a standard for marine pipelaying (p. 124) . . . New coating for water construction (p. 129) . . . True combination angles for pipeline bends (p. 145) . . . Automatic control of diesel-driven centrifugal pumps in parallel (p. 150) . . . How a computer is applied to pipeline design (p. 157) . . . Preventing dangerous pressure by remote control (p. 193).

# Indicted Firms Lose One Round

## . . . as motions to dismiss case are turned down. Efforts to move trial tc Tulsa are continuing.

THE GOVERNMENT scored an initial victory last week, keeping alive its Alexandria, Va., price-fixing suit against 29 oil companies.

Dismissal of the suit was refused by Federal District Judge Albert V. Bryan, who said irregularities charged in the selection of the grand jury were "not at all substantiated."

The 29 companies were indicted last June on charges of price fixing. The charges originally were raised in last year's Senate investigation of the European oil lift after the Suez Canal was closed (OGJ, June 9, p. 68).

Three requests for dismissal of the suit were among a number of motions argued before Judge Bryan last week. Others included a motion for a change of venue to the Federal District Court at Tulsa and for a bill of particulars. These are under study.

Argument on the motion to dismiss was led by former U. S. District Judge Simon H. Rifkind of New York, now a law partner of Adlai Stevenson. Rifkind entered the court proceedings last week for the first time.

**Jurors challenged . . .** Rifkind attacked the make-up of the grand jury which returned the indictment.

"This grand jury was not constituted according to law and what they did does not constitute an indictment according to law," he asserted.

Rifkind leveled a number of charges at the jury. Members were not checked to assure they met the standards of length of residence in Virginia and the court district, freedom from petty larceny convictions and freedom from pressing claims against the Government, he said.

Armistead L. Boothe, attorney for Standard Oil Co. (N. J.), supplemented Rifkind's argument. He claimed that 4 of the 23 jurors in the case when the indictment was returned had attended only one-third of its sessions, having been appointed as substitutes only on November 1, 1957.

"These four were not legally qualified, for they did not hear a substantial part of the testimony," Boothe continued.

Rifkind appeared as counsel for Cities Service and Booth for Jersey Standard, but both spoke for 26 of the defendant companies. Gulf Oil Corp. also had a motion attacking the constitutionality of the indictment, while a third motion was filed by the Sinclair companies on still other grounds.

**U. S. position . . .** Dismissal of the case, as well as a change of venue, was stoutly opposed by the Justice Department.

Joseph McDowell, chief government attorney, asserted that there was substantial compliance with the statutes covering grand juries and the companies had not made a case of prejudice, he said.

The Government is fighting a shift of the case to Tulsa, where company attorneys claim it would be more convenient for the defendants. The department's position is that Alexandria is closer to the offices of most of the attorneys who are taking part in the suit.

# Oil Interest Zooms

## in Canada. Mideast threat has spurred exploration.

CONCERN over the long-range situation in the Middle East is sparking an amazing upsurge in interest in oil and gas possibilities of Canada's far north.

So far this year 745 applications have been received for oil exploration permits covering the vast area extending from the northernmost tip of the Yukon to the Arctic Ocean and the northeastern corner of the Northwest Territories.

In all, only 1,187 such applications have been made, and they date back to 1950. A total of 70,000,000 acres is covered in these applications, but half that is accounted for in permits issued so far this year.

The interest is believed mainly due to the possibility of Middle East oil supplies being cut off.

The federal northern affairs department has announced plans to build a road stretching 450 miles from Flat Creek, east of Dawson Creek, to the Arctic Ocean. Main aim is to provide an access route for handling the heavy equipment required in exploring and exploiting oil lands. It is scheduled for completion by 1962 at a cost of between $5,000,000 and $8,000,000.

Alvin Hamilton, resources minister, is now on a trip to the northern territories. One purpose of his trip is to survey by air and ground a proposed route for the road.

# Illinois Unit, Flood

## is planned in Rural Hill. Shell will be the unit operator.

SHELL Oil Co. has assumed operations of a water-flood unit in Rural Hill field, 5 miles southwest of McLeansboro, Ill., and expects to start water injections this spring.

Operations on the 1,954-acre unit are expected to increase life of the field 8 to 10 years and substantially increase the oil recovery. Shell engineers did not reveal volume of additional crude they expected to recover.

Engineering plans call for injecting 25,000 bbl. daily of water into the Aux Vases sandstone and Ste. Genevieve limestone. Water will be injected into 81 input wells with oil production from 75 wells.

Drilling of 31 additional wells in the field adequately to develop the unit will start this month. Work also will start in October on surface facilities.

A supply of salt water for the project will be taken from five wells to be drilled to the Cypress sandstone formation.

Timetable calls for drilling and construction work to be completed within the next 5 months and for water injection to start next spring. The water-flood will be carried out on a 20-acre, 5-spot pattern. Substantial increases in oil production are expected within a year's time.

Water flooding of depleted fields has developed into a technique of major economic proportions to the oil industry in Illinois. The Illinois Geological Survey estimates that more than 30% of all oil currently produced in the state is by this process.

## New Unit Cuts Pollution

A NEW waste stream treatment unit, built by Shell Chemical Corp. at its Houston plant, will not only reduce stream pollution but save on the water bill as well.

A major addition to Shell's facilities for preventing pollution of nearby streams, the unit reportedly will remove all oil and solid particles and neutralize any chemicals in waste water from the plant.

Waste material going into the unit will pass through five stages of treatment. After purification, part of the water will be returned to the plant for further use, thus reducing the amount of fresh water consumed.

Part of the plant's waste material is now barged 100 miles out to sea and dumped. Some combustible pollutants are fired in a smokeless burner.

# Algeria Play Mushrooms

**. . . as development drilling pans out and more acreage is granted. New concessions mean big spending ahead.**

ALGERIA looks more like a thriving young oil country every day, with known fields shaping up well under development drilling and large blocks of acreage going out to exploration-minded companies.

The best reports come from Zarzaitine field, discovered by CREPS in the eastern Sahara, 35 miles northwest of Edjele field. Royal Dutch-Shell has 35% interest in the company.

Six producers have been completed in Zarzaitine. On the basis of production tests on the fifth and sixth wells, outlook for the structure is "considerably enhanced."

CREPS gave no production figures on the latest wells. But presumably they are better than the third test, the latest for which information is available. The third well flowed 3,200 bbl. daily of 43°-gravity crude from a 164-ft. section topped at 4,350 ft. (OGJ, May 5, p. 89).

The company says it is too early to start estimating Zarzaitine reserves. But the field is now getting the most attention, taking the lead from Edjele and Tiguentourine fields. Two more wells are drilling ahead.

**Hassi Messaoud . . .** There is now hope that Hassi Messaoud field in Central Algeria may extend eastward. Sixteen of 17 wells completed so far are producers. Eleven more are drilling.

Some equipment for the 412-mile, 24-in. pipeline to the Mediterranean has arrived in the Sahara, but actual laying has not yet started. The line is expected to deliver 240,000 bbl. daily to the Mediterranean for transshipment to France in 3 years. More than 10,000 bbl. daily is now being moved out by 6-in. pipeline and rail to the Mediterranean.

**Big names missing . . .** As in earlier concession awards, major United States internationals are notable by their absence.

Five-year permits were granted by the French to a dozen groups on 22,000 sq. miles. The acreage involved was relinquished by other companies earlier this year.

Sinclair Oil Corp. and Newmont Mining Corp. again teamed up in a Sahara concession. They joined with Eurafrep, Safrep, and Ovaim in a 2,930-sq.-mile block on which $4.5 million will be spent.

Phillips Petroleum Co. and a wholly owned subsidiary, Drilling Specialties Co., are participating in two concessions. They and Copefa and Omnirex have agreed to spend $4 million on a 2,730-sq.-mile block. They are partners with Francarep and Copefa on another 2,240-sq.-mile tract, on which $3.5 million will be invested.

Cities Service Co. has an interest along with Francarep and Prepa in a 1,580-sq.-mile block on which they will do $2.4 million worth of work.

The names of prominent independents cropped up in connection with a 695-sq.-mile award which will require at least $1.1 million. Participants include Frandel (Canadian Delhi France), Home Oil Co., Murchison Trust, Grady Vaughn, Jr., Jack Vaughn, Devon Palmer, E. Constantin, Jr., Allen & Co., Francarep, and Petropar.

Pan American Petroleum (Indiana Standard) is partner with Petropar and Cie. Franco-Industrielle et Maritime in a 1,040-sq.-mile block that will require a minimum of $1.6 million.

British Petroleum Co. and Royal Dutch-Shell companies each acquired one block. Ste. des Petroles de Valence (BP) will spend $6.75 million on a 4,400-sq.-mile tract. Cie. des Petroles d'Algerie (Shell) will spend $3.75 million on a 2,430-sq.-mile area.

Francarep, Eurafrep, and SN-Repal will spend $1.25 million on an 1,820-sq.-mile area. Petrosarep (Nahmias Bros.) will spend $1.6 million on a 1,043-sq.-mile block. Cie. Francaise des Petroles d'Algeria will invest $2.3 million in a 1,060-sq.-mile area.

Five-year licenses also were awarded on two fresh areas. Phillips Petroleum, Copefa, and Francarep obtained a 2,240-sq.-mile tract at Beresoff. The area offsets Conorada Petroleum Corp. acreage in Tunisia. Cie. des Petroles d'Algerie acquired 2,430 sq. miles at Tarfaia, 65 miles east of Hassi Messaoud.

# New Refinery for Philippines

A $23-MILLION refinery will be built in the Philippine Islands by Gulf Oil Corp. and a local group.

The Philippine National Economic Council has approved an application to establish the plant made by Gulf and Philippine Investment Management Consultants, Inc.

Earlier this year Gulf and Philippine Investment had asked approval of a contract under which Gulf would supply crude for a 10,000-bbl. refinery to be built on Luzon.

The Philippine firm plans to form a refining and marketing company, which will be the first controlled and operated by Philippine interests. Plans are to complete the refinery late in 1960 or early in 1961. The economic council recommended a $5-million foreign exchange allotment over 3 years.

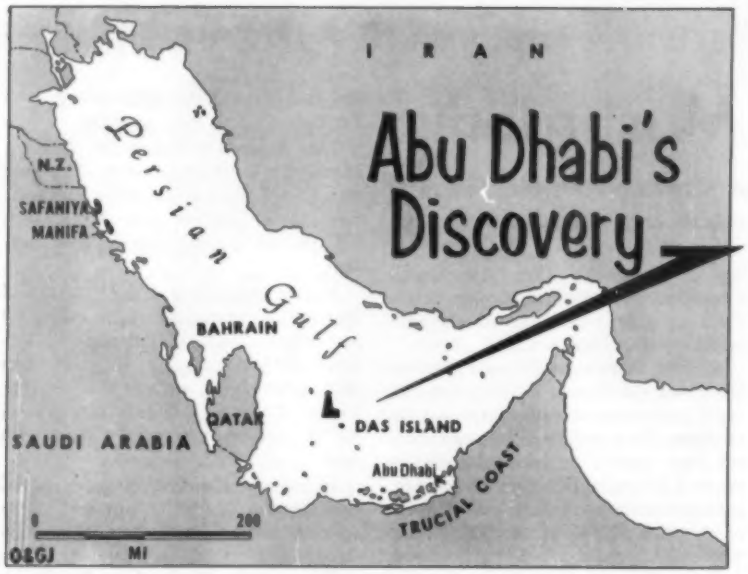
In the past, approval by the economic council has been quickly followed by official government authorization.

**Refinery-run ceiling . . .** The economic council also adopted a financing plan which would help the new company, as well as possible future Philippine-controlled companies, break into local markets. It would slap a ceiling on local refinery runs of domestic marketers.

Caltex and Stanvac would be limited to their 1957 marketing level. Caltex has an 18,000-bbl. plant in operation. Stanvac is building a 25,000-bbl. plant at Bataan. Total consumption in the Philippines last year was about 43,000 bbl. daily.

Royal Dutch-Shell would be permitted to refine and market a maximum of 20,000 bbl. daily. A construction permit for a refinery has already been issued. If the plan goes into effect, and if consumption keeps rising by 11% per year, locally controlled companies will have half the market within 10 years.

Under the Gulf-Philippine Investment deal, at least 60% of the new company must be Filipino owned. Executive control must be in Filipino hands at all times. Foreign technicians must be replaced in not more than 5 years, and their dollar salaries must not require foreign exchange.




# Remote Persian Gulf Test Hits

A WILDCAT in a remote corner of the Persian Gulf may have drilled into another Middle East oil field.

Umm Shaif 1, drilled from a mobile barge 20 miles off Das Island, has flowed at the rate of 2,400 bbl. daily on a limited test. High-quality crude—40° gravity with 1.4% sulfur content—came from Lower Cretaceous Shuaiba limestone. Tests are continuing.

The well is located on a 12,000-sq.-mile offshore concession held by Abu Dhabi Marine Areas, Ltd. British Petroleum Co. holds two-thirds interest, and Cie. Francaise des Petroles, one-third.

The company, in a carefully worded statement, indicated it was hopeful even if it could not tell for sure whether a paying field was in hand.

"Although the results of this first well do not give final proof that an oil field has been found which will justify commercial development, the indications are sufficiently encouraging for the company to decide to drill further appraisal wells on the same structure," the company said.

**Tests yield gas . . .** Shuaiba limestone was the second formation to be tested in the 8,755-ft. hole. Tests have been completed in the Jurassic Arab Zone limestones, which produced gas only.

Umm Shaif is about 100 miles east of the nearest production, Dukhan field in Qatar. The nearest developed Cretaceous production is on Bahrain Island. But the formation is the source of oil in such major fields as Burgan in Kuwait, and Safaniya off Saudi Arabia.

The Jurassic, which yields gas in the wildcat, is the source of most Saudi Arabian production, including Ghawar and Abqaiq fields.

The wildcat is the first drilled on the concession awarded 6 years ago by Abu Dhabi, a British protected shaikhdom. Months were spent preparing a base camp at Das Island. The barge, "Adma Enterprise," has a rig capable of reaching 15,000 ft.

## Italy Eyes Imports

### of gas from Middle East to supplement home supply.

TWO STRAWS in the wind indicate Italy's big natural-gas industry may be just about fully developed.

In the face of a market waiting with open arms, Ente Nazionale Idrocarburi earlier this year was producing only 1.6% more gas than a year earlier. The first 5-month average was 515,000 M.c.f. daily.

There is also a proposal afoot for importing gas into Italy from the Middle East. This is the other sign that state monopoly is not finding enough gas to back up greater expansion.

ENI is expected to propose the importation of liquified methane from Iran at a convention of the Italian industry this month. The gas would be transported to Italy by three 32,000-ton tankers of special design.

While development may be slowing down in the Po Valley, where ENI holds exclusive exploration and production rights, the agency may be making another gain in Italy's legislative halls. Italian sources indicate the government is considering a law granting ENI a monopoly over offshore areas.

## IPC Is Reassured

### by Iraq's new government. More talks planned later.

SMOOTH relations between the new Iraq Government and Iraq Petroleum Co. are now on an official basis as the result of a visit to Baghdad by the IPC managing director.

Both G. H. Herridge and Iraqi officials reassured one another on basic issues. IPC expressed its agreement in principle to giving up portions of its concession areas, held by itself and affiliated companies. The company also framed specific proposals which will be discussed later.

IPC also is raising Iraq's export capacity to 1,170,000 bbl. daily by the end of 1961. The company also assured the government of its willingness to discuss a revision of royalty payments if a neighboring country gets higher revenue per ton.

The government, on its part, repeated its intention to honor existing agreements. It also showed a willingness to arbitrate the dispute on the method of figuring its profits in 1955 and 1956.

## Venezuela to Build Tankers

VENEZUELA is the latest oil-producing country to go into the tanker business.

The government has incorporated Flota Petrolera Venezolana, C.A., (FLOVENCA), putting the country into the international oil transportation trade. Guiliermo Veloz Mancera is president of the new company. Junta Pres. Wolfgang Larrazabal is honorary president.

As a starter the company has signed an agreement with a European shipyard for tankers. It also has an option to carry small amounts of Venezuelan production when the ships are delivered.

Most governments of major oil-producing countries want to establish a national tanker fleet as a means of exerting some control over oil after it leaves their frontiers.

The latest ship launched for a government was a 33,000-ton vessel built in the Netherlands for National Iranian Tanker Co.

# Japanese Shop for New Deals

## . . . in wake of Neutral Zone success. Talks are going on with Ethiopia and Egypt. Sumatra deal is still pending.

TOKYO is undergoing a serious attack of oil fever as a result of the success of Arabian Oil Co. tying down a concession off the Neutral Zone.

Major Japanese financial interests are scrambling after new foreign concessions, and several foreign countries are looking toward Japan as a fresh source of investment capital.

In the months since Neutral Zone rights were nailed down, feelers have gone out to, or have come from, Ethiopia, Yemen, Egypt, Pakistan, and North Sumatra.

Ethiopia is the latest country to join the ranks of possibles. Maruzen Oil Co. has approached the government on a concession in Eritrea along the Red Sea Coast. Masayuki Yokoyama, former minister to Ethiopia, is in Addis Ababa negotiating the deal.

The government a year ago asked Yokoyama whether he could interest a Japanese firm in exploration. Maruzen Oil thought well enough of the idea to give Yokoyama the green light to try to make a contract.

Eritrea, a former Italian colony, was federated with Ethiopia after World War II. Sinclair Oil Corp. pulled out of Ethiopia proper last year after years of poor exploration results.

**Other countries . . .** Across the Red Sea, Yemen has indicated an interest in talking to the Japanese about oil development.

Rights have already been awarded to American and German firms. The German company stopped work months ago on the grounds that the concession grants overlapped. Yemen reportedly is also playing host to technicians from Iron Curtain countries.

Pakistan tried to interest Arabian Oil in a concession but was turned down. An invitation also was issued to other Japanese companies to negotiate a concession. So far there have been no takers.

Tokyo interests a few weeks ago seemed to have the inside track in acquiring rights to production in North Sumatra's old Royal Dutch-Shell fields. However, a survey party, which was to have left for the area last month, still is in Tokyo.

The Indonesia oil agency, Permina, still wants Japanese technical aid and money. But it now indicates it will not permit Japanese to hold an interest in a proposed company, nor rights to sell crude production. The agency also says it wants to avoid entering "any monopolistic agreement with a single Japanese company."

**Egyptian deal . . .** Two of the founders of Arabian Oil Co. are reportedly working on another Middle East concession. But if the deal goes through, they will have to go to the trouble of organizing a second company.

The concession would lie along Egypt's Red Sea Coast. The proposal calls for a $4.8-million investment in exploration and drilling costs. There would be no concession fee.

The business leaders are Taizo Ishizaki, chairman of Arabian Oil, and Ataru Kobayashi, a director. Talks are now starting in Tokyo with a United Arab Republic trade mission.

But there is no connection between Arabian Oil itself and a possible deal with Egypt. The Neutral Zone agreement with Saudi Arabia prohibits the company from any other drilling operations without Saudi consent—and whether the company would ask for, or get, permission to go into a possibly competitive operation is doubtful.

The Japanese have probably withdrawn from the free-for-all bidding for Iranian concessions. The Japanese ambassador to Iran has said flatly that his country's oil companies are not strong enough to compete with other firms for rights in the Persian Gulf. About 18,300 sq. miles on Iran's side of the gulf remain to be awarded.

# Reparations Cut

## by Soviet. Austria will get Russian sulfurous crude.

DETAILS are out on the revised agreement under which Austria will reduce oil reparations to Russia.

Austria will continue to ship 20,000 bbl. daily to eastern Europe. But for the 7 remaining years in the 10-year agreement Russia will help ease the load by shipping 10,000 bbl. daily of its own crude back into Austria.

Russia prefers this arrangement because refineries in Czechoslovakia and Hungary can process Austrian crude without sulfur removal plants, which they do not have. There are no plants in Austria which could treat sulfurous Russian crude, but the country is willing to build one.

The main concern of Austria has been to keep domestic refineries in full operation in the face of declining production. Crude output has slipped to 52,700 bbl. daily from 68,200 bbl. daily in the 3 years since the Russians pulled out.

The 20,000 bbl. daily is being shipped to Russia as payment for oil fields given up by the Russians. Another 4,000 bbl. daily was to be shipped for 6 years in payment for factories released by the Russians. The revised agreement permits Austria to substitute machinery and other products for this oil.

European observers see two reasons behind the Russian move. One is to show other countries, especially West Germany, that it can be nice to neutrals. The other is to tie Austria as closely as possible to Russian economic apron strings.

# India to Build Plant

## in Assam. Second refinery is planned in Bihar State.

INDIA is going ahead with its plan to build a refinery in Assam with Romanian help.

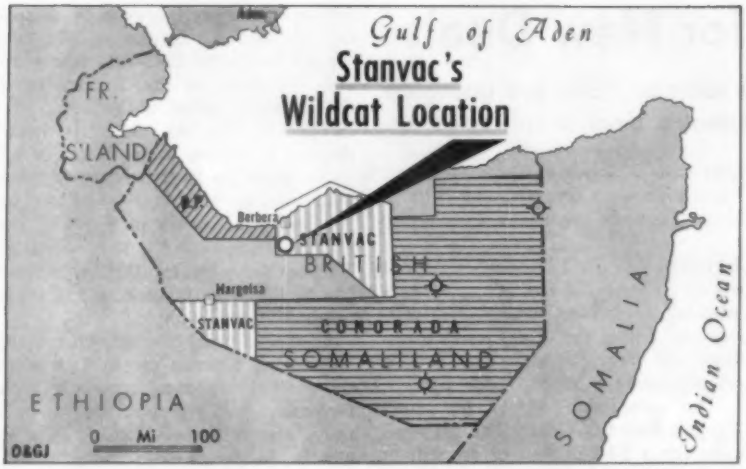
Romania will supply equipment and construction help for a 10,000-bbl. to 15,000-bbl. plant at Gauhati. The $30-million cost will be repaid with a 7-year loan at 2½% interest. A final agreement may be reached this month. This plant was one of two originally planned by the government to process crude from shut-in Nahorkatiya field, which is rated at 50,000 bbl. daily. The other is to be at Baruni, in Bihar State.

These projects were virtually decided months ago, until American consultants filed a final report suggesting one large plant near the field. The report caused the government to review the whole program (OGJ, Aug. 18, p. 125). But the government stuck to its initial decision and has formed Indian Refineries, Ltd., to operate the plants.

## Firms Reject Ceylon Demand

A British-American group of four major oil companies told the Ceylonese Government last week they want a 25-year guarantee against nationalization before they invest $28 million in a new refinery at Colombo.

Royal Dutch-Shell, British Petroleum, Standard Vacuum, and Caltex have been negotiating with the Ceylonese for the past 4 years about the refinery. The companies turned down flatly the Ceylonese demand for government participation and told the government they would have to have the nationalization guarantee.




# Stanvac to Test African Block

THE first wildcat ever drilled in Africa by Standard-Vacuum Oil Co. will get under way soon in British Somaliland.

Dagah Shabell 1 will be spudded 30 miles south of the Gulf of Aden port of Berbera. The site is on the eastern edge of an 11,380-sq.-mile concession, one of two Stanvac blocks in the protectorate.

Stanvac will administer the program from Hargeisa, the capital, 100 miles southwest of the drill site. Seacat Drilling Co., an affiliate of Southeast Asia Drilling Co., will be the drilling contractor.

Unlike many foreign wildcatting ventures, the supply base is comparatively close at hand—only 170 miles due north across the Gulf of Aden at Stanvac's year-old Aden terminal.

Jack K. Dahlberg, general manager of the project, is arriving from the Philippines where he has been directing Stanvac's drilling program in the Cagayan Valley.

Conorada Petroleum Corp. and British Petroleum Co. are the other two companies with concessions. Conorada was the first to start wildcat operations and has sunk three dry holes.

# Loffland to Drill

## for Pan Am in Argentina. Five rigs to go in action.

LOFFLAND Brothers Drilling Co., Tulsa, will do Pan American International's drilling in Argentina.

Pan American has been ordering material for the $60-million drilling program for some time. It is being assembled on the Gulf Coast for shipment to Argentina in a chartered vessel.

Loffland Brothers will put a minimum of five rigs to work in Argentina just as soon as the equipment can be shipped. More rigs may be added later.

Pan American's agreement with Argentina covers development drilling on three structures in Chubut and Santa Cruz where Yacimientos Petroliferos Fiscales, the government oil agency, has already established production.

Pan Am plans to drill 50 wells in the first year of its 15-year contract. If the program achieves good results, another five rigs will be added in the second year when another 100 wells are planned (OGJ, Aug. 4, p. 70 and Aug. 18, p. 126).

Pan Am's contract is one of two recently approved by the Argentine Government. Another development program will be undertaken by Carl M. Loeb, Rhoades & Co. as part of a $100-million contract with Argentina.

# *WORLD BRIEFS . . .*

**The latest well in Lake Maracaibo** completed by Signal Oil & Gas of Venezuela was the most prolific and the fastest-drilled of any on the 43-sq.-mile block. The 10,320-ft. Centro 7 tested 6,600 bbl. daily after being completed in a record 34 days.

**Two new wildcats are drilling** ahead in Libya's Fezzan Province. One is the first in the country by American Overseas Petroleum, Ltd., (Caltex). The other may be the last on Block 1 by Esso Standard of Libya. Amoseas' well is Gebel Uaddan 1, about 230 miles southeast of Tripoli (OGJ, Sept. 8, p. 86). Esso's Ramla 1 is a few miles north of the noncommercial find at Atshan on Block 1.

**Venezuelan natural gas may find a** market in the District of Bolivar. Creole Petroleum Corp. has offered to make 35,300,000 cu. ft. daily available for a system which would supply industry and residential areas. Trigaco Co., Caracas, is making a preliminary study of the project.

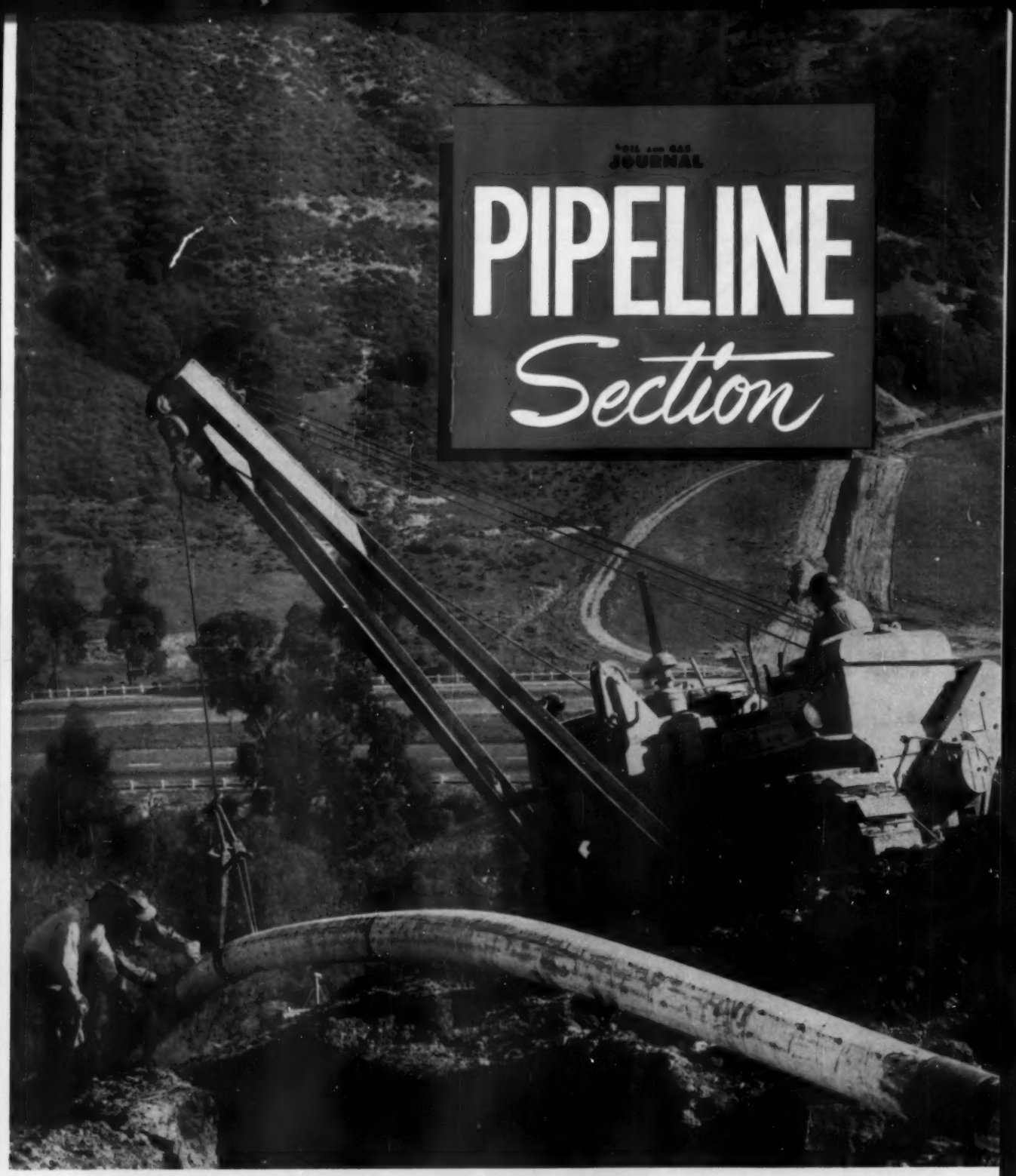
**Venezuela and Argentina are wrapping** up a trade agreement that will permit Yacimientos Petroliferos Fiscales to buy $10-million worth of oil in one year from private companies in Venezuela. YPF will use its own tankers to haul the crude.

**A geochemical survey using an Atlantic** Refining Co. process will cover 1 million acres along the coast of northern Cuba. The method detects the presence of gas seeps in water-covered areas. The survey will run between Matanzas and Nuevitas in Camaguey Province. Esso Standard, Royal Dutch-Shell, and Standard Oil Co. of California will be partners, with Atlantic Refining the operator.

**The first French synthetic-rubber** plant will open in 3 years near Royal Dutch-Shell's Berre refinery. Partners in the project are Shell-St. Gobain, Michelin, and Cabot-Texas Butadiene. The plant will produce 50,000 tons of SBR synthetic rubber per year.

**Tunisia has awarded two new concessions** over 800 sq. miles of southern Tunisian territory to Ste. de Recherche et D'Expoitation des Petroles en Tunisie (SEREPT). The licenses bring the company's total acreage to more than 23,000 sq. miles.

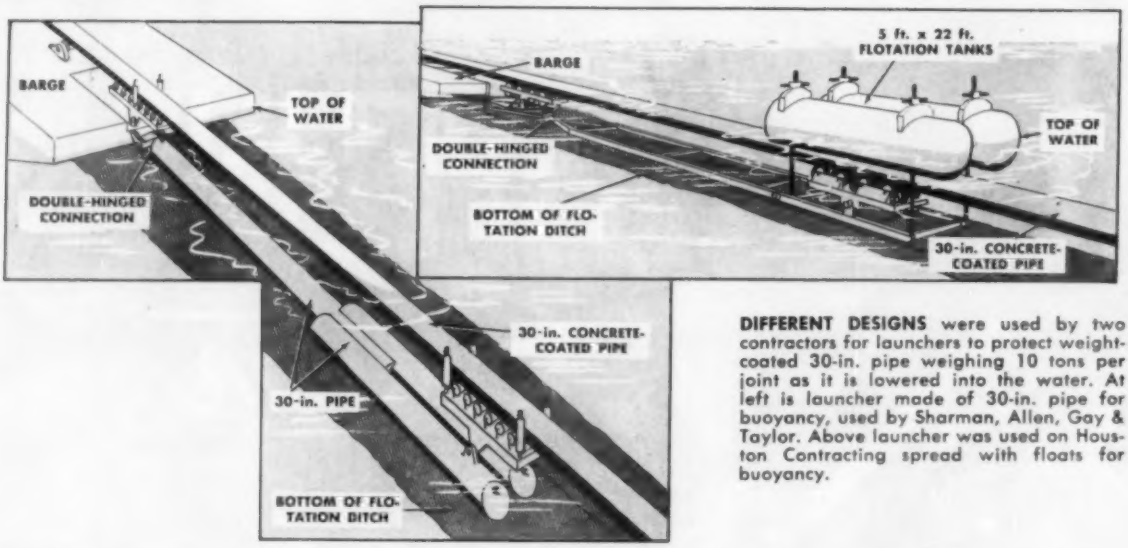
**Bolsa Chica Oil Corp.'s first test on** a 370,000-acre concession in southeast Turkey was abandoned at 6,449 ft. The dry hole, the Zengilan 1, is about 50 miles north of Diyarbakir. The rig was being moved about 17 miles east for a 6,000-ft. test of another structure.




Increased efficiency and improved design, construction, operating, and maintenance practices are the watchwords of the pipeline industry today. All these are traditionally reflected in the Journal's Annual Pipeline Number. On the next 50 pages you'll read about:

Remote control of engine and electric stations . . . quick detection of dangerous high or low pressures . . . automatic emergency shutoff at terminals . . . positive-displacement metering at custody-transfer installations.

Applying a computer to a specific design problem . . . higher standards for marine construction . . . a new weight-corrosion coating . . . operating practices of a unique products system since its beginning . . . an innovation to control erosion and improve backfill repair . . . and operating and maintaining a high-pressure, long-distance gas line.




**DIFFERENT DESIGNS** were used by two contractors for launchers to protect weight-coated 30-in. pipe weighing 10 tons per joint as it is lowered into the water. At left is launcher made of 30-in. pipe for buoyancy, used by Sharman, Allen, Gay & Taylor. Above launcher was used on Houston Contracting spread with floats for buoyancy.

These contractor designs meet strict specifications as . . .

# TGT sets a standard

## for marine pipelaying

BY PAUL REED and GENE KINNEY
Pipeline Editors

HIGH STANDARDS of marine pipe laying are being set by Tennessee Gas Transmission Co. in the first large-scale 30-in. construction in the Gulf Coast marshland of Louisiana.

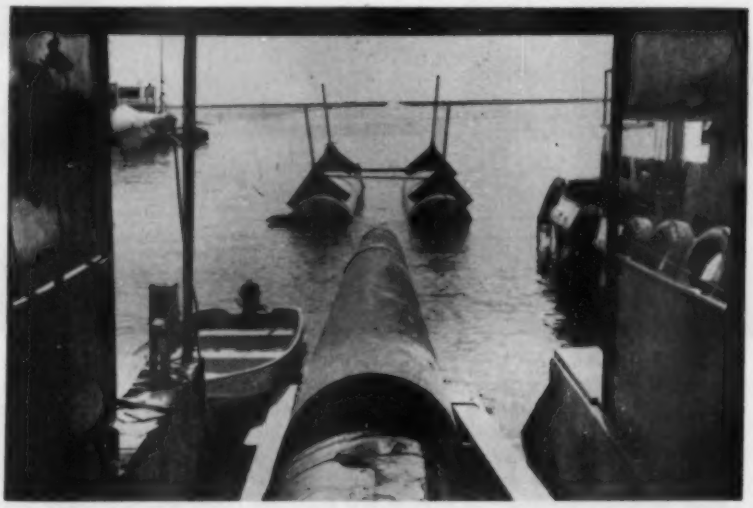
Tennessee Gas is laying 66 miles of concrete-coated gas line across the Mississippi River Delta marsh to Bay St. Louis, Miss. It's part of a system connecting offshore fields to its main line at Portland, Tenn. The line is being laid under the most rigid specifications. Contractors are living up to them. The result is a smooth and high-quality job which is remarkable for handling pipe weighing 10 to 11 tons per 40-ft. joint.

There are unavoidable hairline cracks in the concrete weight coating, to be sure. But the wide cracks which have been a common sight on marine projects are nowhere to be found. The excellent condition of the weight coating as it is launched is evidence that the protective coating also is suffering less damage and there is less fiber stress on the pipe.

Nor has progress seemed to suffer much from high standards. Production of lay barges operated by the contractors, Houston Contracting Co. and Sharman, Allen, Gay & Taylor, would do credit to dry-land spreads. Both have been making 60 to 65 joints, or 2,400 to 2,600 ft., in 10 hours. Houston works two tours and operates around the clock.

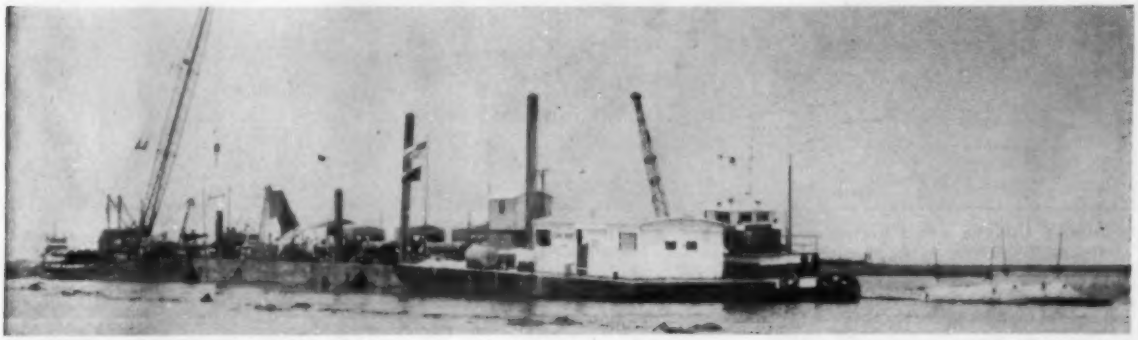
### Minimum Radius of Curvature

The principal reason for the exceptional quality is a specified minimum curvature of pipe as it is launched from the end of the barge. Heretofore



**PIPE LAUNCHER** used by Houston Contracting is a patented Collins Construction Co. design. Launcher pivots off inclined ramp alongside barge.

**SHARMAN,** Allen, Gay & Taylor lay barge looking from the rear of the assembly line as pipe enters water after field joint of concrete is made.



**HOUSTON CONTRACTING** lay barge shows a crane lifting a joint to the first welding station. At extreme right is the pipe launcher or "stinger."

pipe in marsh county has been laid off the end of the barge from a catchoff cradle directly into the ditch. The curve depended on the slope of the barge, the cradle, and the depth of the water.

On this job the contractors were required to maintain a curve with a radius of 2,500 ft. or greater. In arriving at this specification, the company was guided by experience with some 500 to 600 miles of water construction laying pipe up to 26-in. in diameter. The 2,500-ft. minimum radius holds stress on the concrete to a maximum of 1,794 psi.; fiber stress in the steel is computed at 15,000 psi., allowing adequate safety factor for the X-52 pipe (see Table 1).

### Pipe Launchers

These minimum standards provided the basis for contractors' design and outfitting of lay barges. Three methods were used to stay above the 2,500-ft. radius:

. . . **Specially designed** pipe launchers which pivot from the end of the last barge in a three-barge train.

. . . **Controlling** the slope of the last barge, which is also hinged, by ballasting.

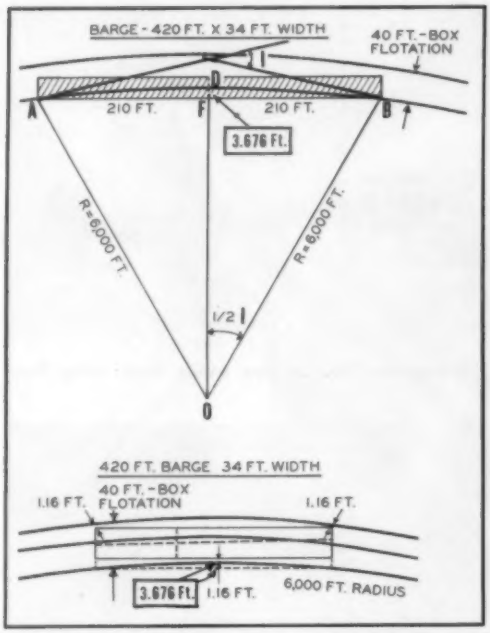
. . . **Adjustable** rollers which support the pipe along the assembly line.

The principal means of controlling curvature were pipe launchers, or stingers, similar to those which have been used on deep-water projects. The contractors employed different types but both provided enough buoyancy to meet company specifications.

**PIPE LAUNCHER** of Sharman, Allen, Gay & Taylor pivots from the end of the barge where it is attached 1½ ft. below water surface, riding out of sight.

**Sharman, Allen, Gay & Taylor . . .** This contractor's stinger was built with 30-in. pipe. A single 30-in. .375-wall pipe comprises over half the 85-ft. length, the rest being twin 30-in. pipes with .250 wall. Welded pipe is launched from rollers of the same type that support the pipe on deck. The stinger is attached by a swivel to the barge 1½ ft. below the water surface. It rides free of the bottom, preventing backfilling ahead of the pipe.

The stinger is equipped with valves for watering and dewatering to control buoyancy. However, no adjustment was needed. Sharman, Allen, Gay & Taylor's design proved to have the




**HIGHWAY CURVES** avoid horizontal bends. Fig. 1.

**PIPE GANG** runs stringer bead at the first of six welding stations on Sharman barge.

precise buoyancy for laying in Lake Borgne, which ranges from 8 to 18 ft. in depth.

Profiles showed the pipe to be going off the barge at a 2,500-ft. radius. For another project under similar conditions, a longer launcher, perhaps 125 ft. instead of 85 ft., is indicated to provide a margin of flexibility. But the original design met minimum requirements and laid the pipe in excellent condition.

**Houston contracting . . .** The pipe launcher on the Houston spread is a patented device designed by Collins Construction Co. and modified by Houston. Buoyancy was provided by two huge floats, instead of empty pipe, mounted on a frame extending 74 ft. behind the last barge.

The pipe rides on three dollies, each having four sets of three rubber tires. The first two dollies are mounted on an inclined ramp alongside the barge. The first is near the end of the barge, the second just behind the barge. The third is at the end of the stinger which pivots from the ramp.

The slope on the stinger is altered as needed by adjusting vertical screws to raise or lower the floats. Further adjustment is possible by ballasting. However, only mechanical adjustments have been necessary to maintain the proper slope.

Laying at —10 ft. mean low gulf, Houston was able to keep a radius of 3,000 ft., well within specifications. Profiles were run at the beginning of construction on both spreads and were checked daily in the early stages. Afterwards, inspectors could tell from the condition of the concrete whether the profile should be rechecked to make sure the pipe curve wasn't excessive.

### Horizontal Angles

To minimize horizontal stresses, Tennessee Gas this year went to the "highway curve" method. Where the pipeline route requires a bend, right-of-way is bought on a curve with a radius of at least 6,000 ft. This radius is ideal for a barge train 30 ft. wide laying in a flotation canal 40 ft. in width (see Fig. 1).

No bends were made on the lay barges. If a horizontal bend was made, it would interrupt the assembly line. Another rig would be needed to tie up loose ends or the barge train would have to be torn apart.

**TABLE 1—MINIMUM RADII OF CURVATURE FOR CONCRETE-COATED PIPE**
**(using concrete stress of 1,794 psi.)**

| o.d. Pipe (in.) | WT* (in.) | Neg. Buoy. (%) | o.d. Coating (in.) | Radius of curve (ft.) | Steel stress (psi.) |
|---|---|---|---|---|---|
| 30 | 0.500 | 122 | 35.875 | 2,500 | 15,000 |
| 26 | 0.500 | 151 | 33.625 | 2,343 | 13,870 |
| 20 | 0.406 | 149 | 25.625 | 1,786 | 14,000 |
| 16 | 0.406 | 149 | 19.875 | 1,385 | 14,440 |
| 12¾ | 0.344 | 152 | 15.875 | 1,106 | 14,410 |
| 12¾ | 0.312 | 152 | 16.125 | 1,124 | 14,180 |

**CRANE** swings joint of concrete coated pipe into position for pipe gang to start welding.

### Welding and X-Ray

Each spread used 12 welders and six welding stations, one running the stringer bead and hot pass, four the filler, and one the cap weld. Joints were X-rayed 100%. Each contractor X-rayed from the inside at first, but Houston changed to outside X-ray to get away from mechanical problems. Three X-rays were required to get around a weld but further delays from

**A-FRAMES** are specially designed to cradle pipe for tie-ins.

**TIE-IN** barge has float at end to keep pipe curve radius within specifications.

this cause were avoided. Under the original system Houston had two stations for each welding operation and pulled two joints at a time instead of one.

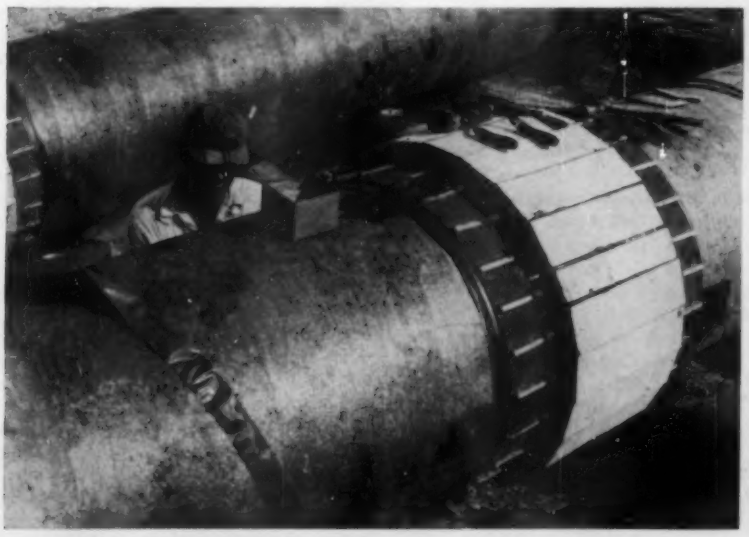
The company does not permit pulling against the pipe to move the barge. A winch line pulls against anchors which are positioned by a towboat.

When a defective weld was found, a welder had to be sent inside the long string of hot pipe to patch it. Cutting the pipe, beveling, and making another weld could delay progress half a day or more. So, undesirable as it is, inside patching is the only alternative to a costly delay for the contractor.

### Trenching and Backfill

Trenching was subcontracted to J. Ray McDermott, Inc., on the Sharman spread and Monroe Wolfe on the Houston spread. Dredges equipped with 8-cu.-yd. clamshells cut 100 ft. of 25 by 8-ft. ditch an hour across Lake Borgne, which had a silty clay bottom and made a firm ditch.

Pipe was laid so as to provide the 3-ft. cover required by the U. S. Army Engineers and desired by the company to protect the pipe. The dredge scattered spoil in a wide sweep to avoid piling high mounds in the lake during trenching. In backfilling the remaining spoil was scattered to a height of 1 ft. or less to meet engineers' requirements. No backfill was necessary in marsh canals. Natural backfill is provided by tides and siltation.



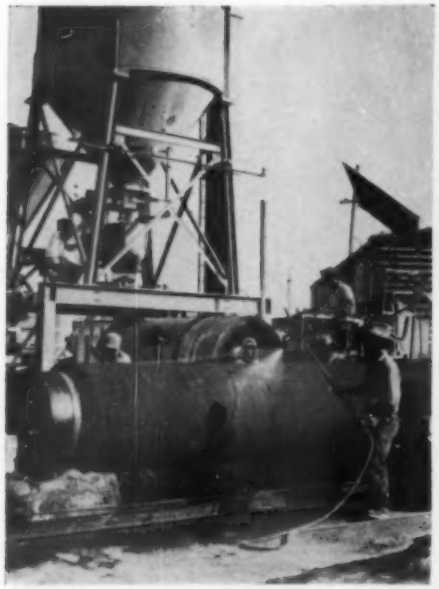
**ZINC BRACELET,** a TGT innovation for cathodic protection, is attached to pipe in yard prior to weight coating.

### Tie-ins

A tie-in with pipe weighing some 540 lb. per foot in air and 97.5 lb. per foot. in salt water is a major operation. The tie-in where TGT crossed Interstate Oil Pipe Line near the gulf was perhaps the most ticklish phase of the entire job.

Several days are needed to make a tie-in under these conditions. Four specially designed A-frames were mounted on two 110-ft. barges to cradle the pipe. The A-frames, having a 6:1 advantage, did the work of sideboom tractors on land. They held a load of 250 to 300 ft. of pipe suspended from the bottom.

The tie-in crew had one big sideboom and a large crane mounted on a third barge for pipe handling. A diver was employed to make sling hookups under water. The pipe curve was controlled by two floats at the end of the barges.



**CONCRETE** coating weighing 547 lb. per ft. is applied to pipe for negative buoyancy.

**MISSISSIPPI RIVER** crossing pipe is welded in three sections totaling 4,000 ft. before being pulled across the 80-ft.-deep stream between Port Sulphur and Point a La Hache.

### Zinc Bracelets

Cathodic protection on the line is another special Tennessee Gas design. Zinc anode bracelets weighing 1,000 lb., developed for an offshore line, are placed on the pipe at intervals determined by corrosion engineers. In Lake Borgne, they are located every 1,500 ft.

The bracelets are put on in the coating yard before concrete is applied. They are the same thickness as the concrete, permitting smooth movement of pipe on the lay barge.

The usual type of sacrificial anode installation is vulnerable to destruction by Gulf Coast storms. Connecting wires from anode beds to pipe may be broken. Bracelets run no such risk, however, and is designed to provide "permanent" corrosion protection.

### Pipe and Coating

Pipeline design called for 30-in. X-50 and X-52 in the following wall thicknesses:

**.500-in.** for general marsh and lake construction comprising most of the line.

**.625-in.** for valve assemblies and road crossings, and the Mississippi River crossing approach.

**.656-in.** for the river crossing.

Weight coating was of concrete with an aggregate composed entirely of iron ore to give negative buoyancy of 122 to 149% (see Table 2). Coating was applied by H. C. Price Co., at Harvey, La., and Rosson-Richards and Anchor Wate at the Delta Shipyards, New Orleans.

The quality of the weight coating was indicated by the fact that 2 to 4 hours were required to chisel concrete from the pipe to make a field joint at the Interstate crossing.

TGT for the first time used an asphalt-mastic protective coating (Somastic) ⅝-in. thick on the section from the gulf to the Mississippi River. The coating was undamaged by hammer and chisel blows at field joints. It is isolated by flanges from the rest of the line for cathodic-protection test purposes. The remainder of the line was double-coated and double-wrapped with coal-tar enamel and fiber glass. Field joints were wrapped with a 35-mil polyvinyl adhesive tape.

### River Crossing

The Mississippi River is 4,000 ft. wide and 80 ft. deep at the crossing site between Port Sulphur and Point a La Hache. The crossing, contracted to Collins Construction Co. will be made in three sections.

A 3-yd. clamshell digs a pilot ditch, checking the bottom for logs ahead of the jetting machine which cut the pipe ditch. The pipe, buried to a depth of 20 ft., or about 100 ft. below the river surface, is laid in a downstream catenery.

**TABLE 2—WEIGHT COATING DATA**

30-in. x 0.500-in. Pipe in Salt Water (for most of main line)

Negative buoyancy—122%.
Concrete thickness—2¾-in.
Concrete weight 375 lb./ft.
Weight of concrete coated and wrapped pipe—546.75 lb./ft.
Maximum density which can be displaced—77.89 lb./cu. ft.
Negative buoyancy—97.5 lb./linear ft.
Concrete density—190 lb./cu. ft.

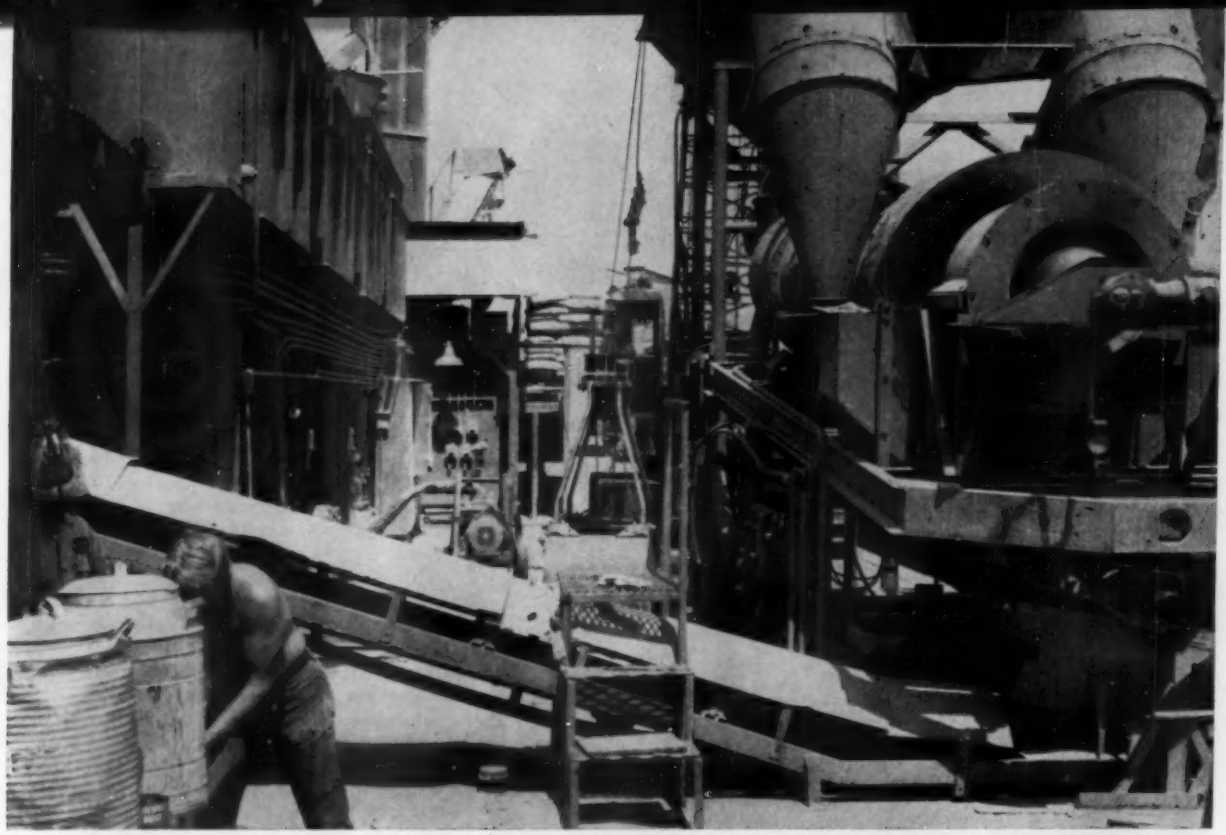
30-in. x 0.500-in. Pipe in Salt Water
(for Intracoastal Canal crossing and Mississippi Gulf Outlet crossing)

Negative buoyancy—136.
Concrete thickness—3½-in.
Concrete weight—489 lb./ft.
Weight of concrete coated and wrapped pipe—660.75 lb./ft.
Maximum density which can be displaced—86.72 lb./cut. ft.
Negative buoyancy—173.13 lb./linear ft.
Concrete density—190 lb./cu. ft.

30-in. x 0.656-in. Pipe in Fresh Water
(Mississippi River crossing)

Negative buoyancy—149%.
Concrete thickness—3¼-in.
Concrete weight—465 lb./ft.
Weight of Concrete and Somastic coated pipe—727.05 lb./ft.
Maximum density which can be displaced—93.04 lb./cu. ft.
Negative buoyancy—232.70 lb./linear ft.
Concrete density—190 lb./cu. ft.

*Wall thickness.



**DRY-MIX** materials for rubberized-asphalt-mastic weight and corrosion coating are mixed on this barge before being transported to the coating barge.

## Southern Natural specifies

# New coating for water construction

BY PAUL REED AND GENE KINNEY
Pipeline Editors

TEST RESULTS on pipe coated with a new combination protective and weight coating have convinced Southern Natural Gas Co. of its desirability for water construction.

The new rubberized-asphalt-mastic coating, called Timcoat for its developer, Gen. P. H. Timothy, was first applied in the field in 1956.[1] It has performed well enough since to justify its adoption wherever Southern Natural uses weight coating. The company reports that the coating has proved to possess the following characteristics for which it was designed:[2]

... **Ductility and durability** to permit lowering to the bottom of the ditch in water several feet deep without cracking or other damage.

... **"Infinite" resistance,** providing almost perfect insulation to control electrolytic corrosion.

... **Excellent bond** to the pipe without a primer.

... **Smooth field application** without the need for a field joint.

Southern Natural started this summer laying some 220 miles of marsh, swamp, and offshore lines requiring weight coating. The supply lines are part of a 3-year program, starting this year, to increase its delivery capacity by 350,000 M.c.f. daily. Total construction will amount to 1,200 miles, largest in the history of the company, whose original system was built in 1929.

Southern Natural plans to coat all pipe through 12-in. on a barge equipped with an elaborate coating plant. Diameters above 12-in. for the time being will be coated in a yard under construction at Belle Chasse, La., near New Orleans, by Brown & Root, Inc., which, with Southern Natural, owns Timcoat Co. This assumes completion in time to meet construction schedules.

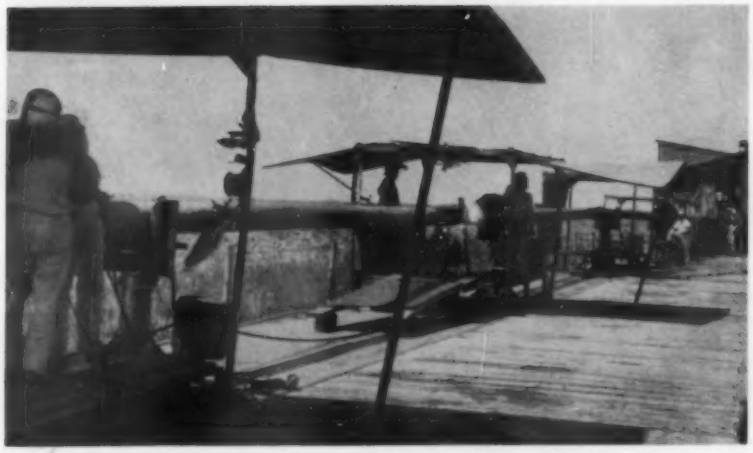
The yard, to be in operation this fall, is regarded as an intermediate step in the coating application, rather than a shift from barge to yard coating. It will permit mass production to provide coated pipe for several projects. Long-range plans anticipate barge coating of the largest diameters which would be used in marine construction.

Thus far the only pipeline to use the new coating has been Southern Natural. But others have expressed an interest and may experiment with it as additional coating-plant capacity becomes available.

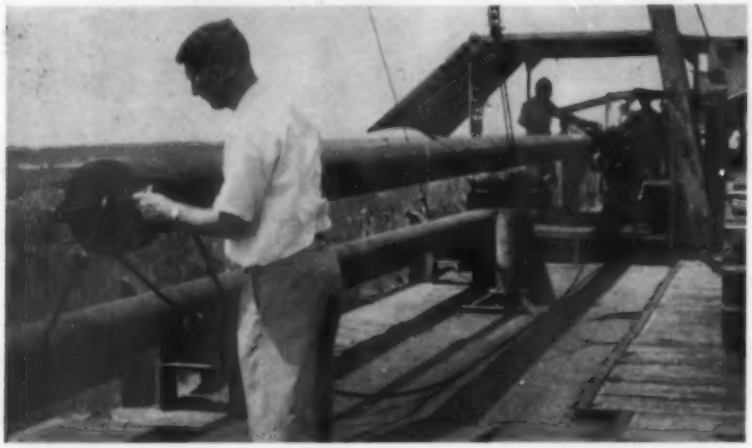
Improvements have been made in the coating since its application on 30 miles of 12-in. and 0.75 mile of 8-in. in the South Louisiana marsh 2 years ago. But basically it's the same. Slight materials changes have resulted in a superior coating which is being used this year.

### Welding and Coating Operations

The first project on which the Timcoat Co. coating barge was used this year was 12 miles of 10-in. connecting Tantine field on the Louisiana coast below New Orleans to Southern Natural's line at the Mississippi River near Fort Jackson. This job



**PIPE IS WELDED** on lay barge in advance of cleaning and coating.



**BARGE TRAIN** is moved by pulling against cap on the end of pipe being examined by Jerry Weldon, Southern Natural engineer on project.

also includes some 8 miles of 6-in. from Bayou Felice field. Brown & Root has the prime contract and Timcoat Co. the coating contract.

This project was nearing completion when it was observed late in August. The spread was making 100 joints a day, or 4,000 ft., with ease, and sometimes 110 joints were made. The barge had storage capacity for materials to last a complete working day of 10 hours.

Between 5 and 6 minutes were required to add one 40-ft. joint of 10-in. The coating operation actually consumed only 3 minutes. The limiting factor on production was welding.

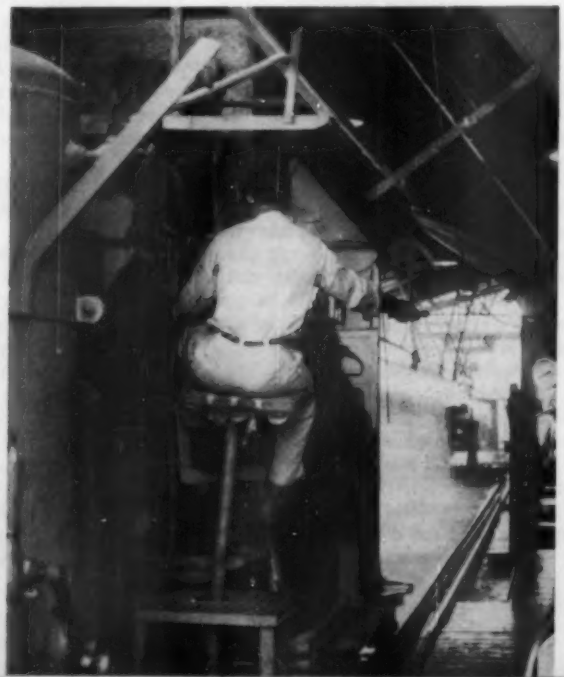
Using two welding stations, with two welders on stringer bead and hot pass and two on filler and cap weld, a weld could be made about every 5 minutes. The addition of one welding station on 10-in. would speed production only slightly but would be justified on the next larger diameter.

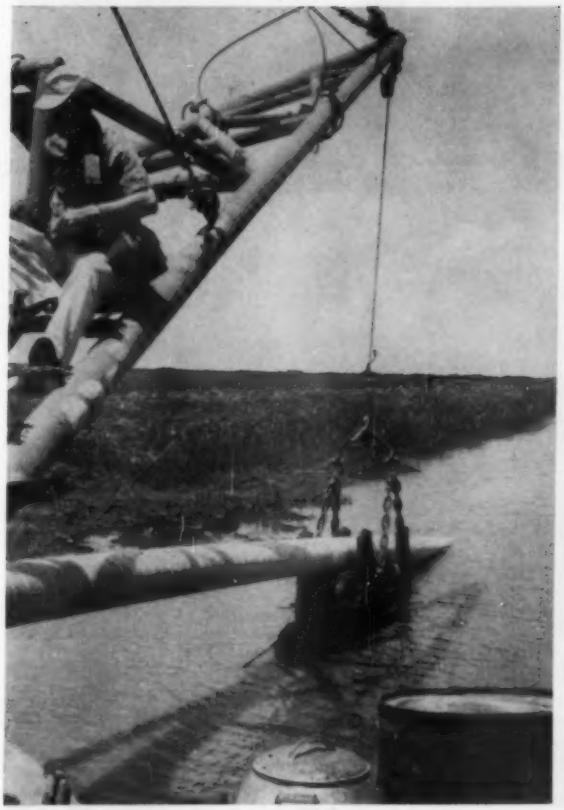
The pipe was welded, X-rayed, and heated to 115°-120° F. on two 110 by 30-ft. barges. The coating was applied on a separate barge of identical dimensions tied to the rear of the second barge. The pipe was cleaned, flame dried, and passed through the coating machine which extrudes a continuous coating on the pipe under pressure. The coating is compacted by vibration of the coating assembly during application.

The coated pipe is wrapped with muslin under tension immediately behind the coating machine. The wrap prevents sagging of the hot coating.

**COATED PIPE** is wrapped with muslin to hold hot coating in place.

**WATER SPRAY** cools coating and hot mix is fed into machine to repeat the cycle.





**CRADLE LOWERS** pipe into flotation ditch at the rear of the coating barge.

**COATING SAMPLE** is cut from pipe and tested daily to check for proper weight.

which is applied at 260°. Originally the coating was reinforced with a glass-mesh outerwrap. The glass stretched slightly, however, and muslin, which shrinks when the cooling-water spray is applied, has proved more satisfactory and is cheaper. The coated and wrapped pipe is continuously sprayed until it is lowered into the ditch from a cradle at the rear of the coating barge.

When the coating operation is ready to begin, the coating machine is locked to the welded section of pipe. The machine is mounted on an electric motor-driven car which rides on tracks. When the barge train is moved forward the length of one pipe joint by a winch tractor pulling against the pipe, the machine travels to the rear of the barge. When the pull has been completed, the machine applies the coating while traveling to its original position. Meanwhile welding has started on the next joint in preparation to repeat the cycle.

### Timcoat Materials

The coating operation, from dry mix to extrusion of the hot mix, required 27 men, of which 13 were on the coating barge itself. In addition to the coating barge there were the dry-mix barge, two shuttle barges, and four to six materials barges. The dry-mix barge was located at a point accessible to truck and water traffic and within 4 miles of the lay barge.

The coating can be mixed in a range of 136 to 230 lb. per cu. ft. by varying the aggregate. The 136-lb. mix, used on the 10-in. project with coating thickness of approximately 1 in., had an aggregate of sand with limestone filler. In the heaviest mixtures the sand and limestone would be replaced completely by barite for the coarse aggregate with powdered barite for filler.

These ingredients, plus a powdered asphalt, are metered from hoppers onto a conveyor belt which feeds a dry-mix machine. The asphalt additive controls penetration and improves stability. The dry mix is deposited on another conveyor for loading into a shuttle barge. The orginal scheme also included a powdered rubber to be introduced in the dry mix to improve stability and prevent embrittlement.

A copolymer latex has been substituted for powdered rubber, and this liquid is added at the coating barge. The other materials added at the barge are emulsified asphalt binder, made from desalted crude, and chopped glass fiber. The glass reinforcement increases hot stability and resistance to cold flow.

### Coating Characteristics

The dielectric strength of rubberized asphalt, according to Goodyear Tire & Rubber Co. tests reported by Southern Natural, is unusually high. Four test specimens of 8⅝-in. pipe were planted on the Mississippi Gulf Coast in February 1956. They were attacked by marine organisms. But tests conducted by Cathodic Protection Service over an 18-month period showed no current drain. At the end of the tests coating resistance was considered to be "infinite."

Southern Natural reports that the rubberized asphalt coating is competitive with enamel and concrete. It expects over-all laying costs to be cheaper with the new-type coating.

### References

1. Resen, Larry, "Weight Coating Applied by Extrusion," The Oil and Gas Journal, December 10, 1956, p. 114.

2. Brown, L. N., "Development and Application of High Density Asphalt Mastic Coating," ASME paper, presented September 22, 1957, at Tulsa.

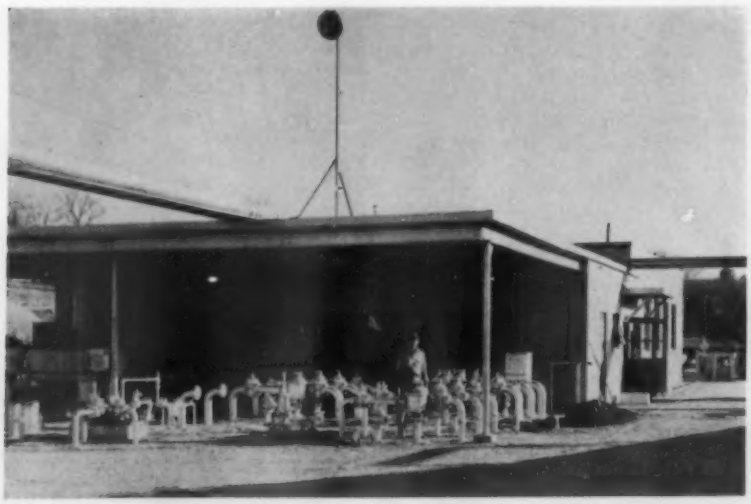
**WHITING STATION** building is shown at right, with manifold in foreground. Building at left rear is suction manifold building, and in front of it is the prover-tank building.

## Standard of Indiana reports on

# 19 years of products pipelining

### Company has aided in developing many improvements that are enjoyed by industry today, as for example three types of automatic flash testers

**BY NORMAN F. TIETZE**
Division Manager
Standard Oil Co. (Ind.)



**SUGAR CREEK STATION** building and metering facilities.

MANY PHASES of products-pipeline operations and maintenance have changed since Standard Oil Co. (Ind.) constructed its first products line in 1939. Some of the changes are technical, confined to equipment and new techniques. Others are those developed through experience and which are essential to economical products pipeline operation and maintenance.

#### External Pipeline Protection

Various types of coatings have been used to protect Standard's lines externally. Principal among those used are: parolite, coal tar, somastic, and concrete. Except for coating, no other

means was employed to protect lines externally until 1947 when the first cathodic protection installation was made.

Since this program was initiated, the decrease in leak frequency has proved to be justification for the expense involved. Today all lines are cathodically protected either through the use of rectifiers or magnesium anodes. All such usage is conducted to minimize interference with facilities of other companies.

### Internal Pipeline Protection

Originally, little was done to preserve the internal surface of the pipe. The only attempt to maintain efficiency was through the periodic scheduling of scrapers to remove rust and sediment. The first departure from this practice used water-soluble inhibitors. These agents proved successful to a great degree in protecting the internal surface of the pipe. Free water in the inhibitors, however, had an adverse effect upon products specifications and created undesirable icing in the northernmost sections of the system.

As a result of these effects, dehydration of products was used on most lines for a time and is still used in some isolated cases. Dehydration was successful in gaining desired objectives, at low operating cost; however, it had inherent shortcomings which later led to the consideration of product-soluble inhibitors. The principal disadvantages of dehydration are:

1. High original plant investment.
2. High maintenance cost due to size of plant and associated facilities.
3. Measurable increase in product commingling.
4. Not conducive to future problems concerning automation.

Today lines are protected internally through the use of a product-soluble inhibitor developed by Standard's research department. This agent, although higher in operating cost due to materials, has the advantages of low plant investment, a minimum of maintenance, no added fittings which would increase commingling, and adequately furnishes the desired internal protection of facilities.

### Product Control

Since the beginning, products have been delivered into and from Standard's lines through meters. Accuracy within 0.1% has been possible through the regular testing of meters against prover tanks which are calibrated yearly to assure correctness. Originally meters were tested on each product batch to determine the applicable correction factor. Improved control of internal rust and sediment increased meter life and the duration of applicable factors to the extent that in many cases the period between tests could be extended.

This is especially true in the case of remote-controlled facilities where it is possible to schedule tests monthly, or even quarterly, at the convenience of operating personnel. Such tests are usually run from product tankage and are not dependent upon the limitation that the product be on stream.

The interconnection of lines led to

## Standard of Indiana's pipeline system

*How it grew, and how it's operated*

FIRST PRODUCTS pipeline of Standard Oil Co. (Ind.) was laid in 1939 from Sugar Creek, Mo., to Council Bluffs, Iowa, a distance of 171 miles. This was an 8-in. line with one pump station consisting of 450 hp. at Sugar Creek and one terminal at Council Bluffs. Since that time, Standard's products pipeline system has increased to 2,330 miles with 20,000 available horsepower. This pipeline system now is so versatile that four of Standard's six refineries are interconnected, namely, Neodesha, Sugar Creek, Whiting, and Mandan, along with 20 pipeline terminals, 1 bulk plant, 1 boat-loading dock and 1 barge-loading facility. Table 1 is a chronological record of the development of this system.

The specific task of operating the products-pipeline system is supervised by a general superintendent under the direction of a manager - transportation department in Chicago. The products-pipeline field operations are supervised by three division managers, centrally located in the areas under their supervision. These division managers report to the general superintendent in our Chicago general office. These division offices are located at Minneapolis, Kansas City, and Chicago. Each division manager is assisted by a staff consisting of a division superintendent-pipelines, a division superintendent-mechanical, a division engineer, a division right-of-way and claims agent, and an office manager. The division superintendent-mechanical is responsible for maintenance, operations, and personnel of pumping stations and mechanical equipment. The division superintendent-pipelines is responsible for the maintenance and personnel involved in pipeline maintenance and repair and microwave communications.

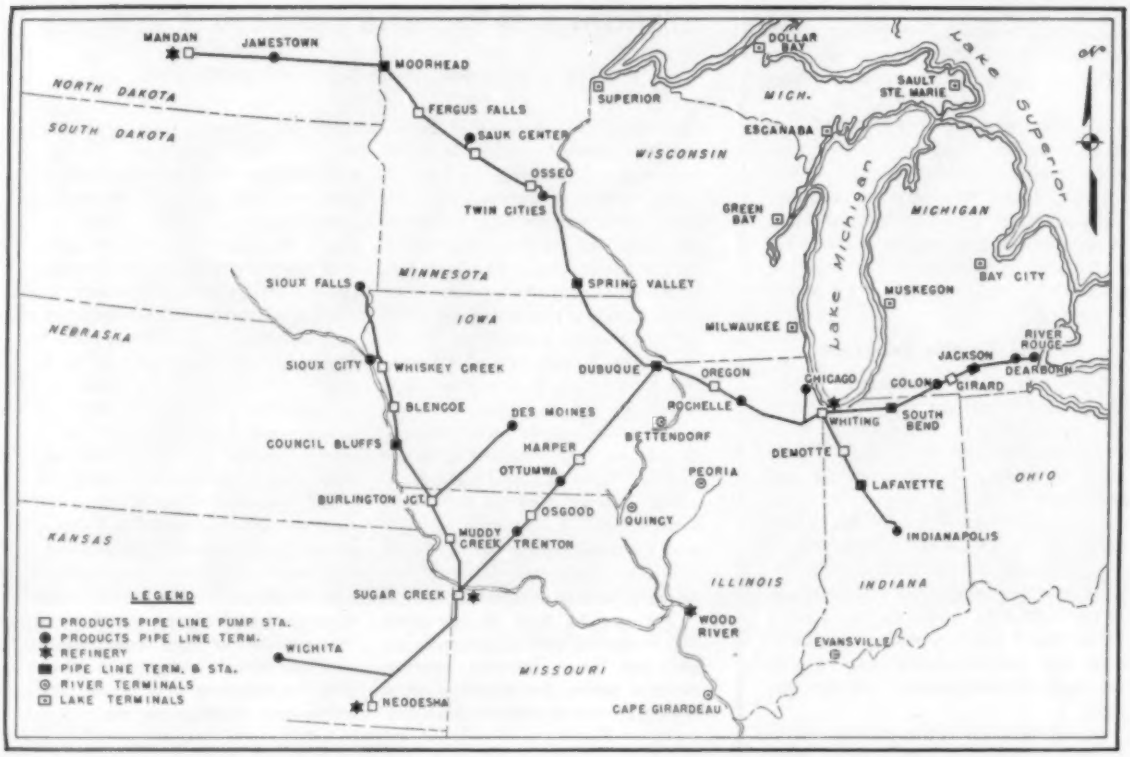
**TABLE 1—CHRONOLOGICAL RECORD OF INDIANA STANDARD'S PIPELINE SYSTEM**

| Year built | Distance (miles) | Size (in.) | Location |
|---|---|---|---|
| 1939 | 171 | 8 | Sugar Creek, Mo., to Council Bluffs, Iowa |
| 1941 | 169 | 6 | Council Bluffs to Sioux Falls, S. D. |
| | 110 | 6 | Burlington Junction, Mo., to Des Moines, Iowa |
| | 150 | 8 | Whiting, Ind., to Indianapolis |
| 1946-47 | 207 | 10, 12 | Whiting to Dubuque, Iowa |
| 1946-47 | 466 | 8, 10 | Dubuque to Moorhead, Minn. |
| 1951 | 140 | 8 | Neodesha, Kans., to Sugar Creek, Mo. |
| 1952 | 309 | 12 | Sugar Creek to Dubuque |
| 1953 | 243 | 10, 12 | Whiting to River Rouge, Mich. |
| | 200 | 10 | Mandan, N. D., to Moorhead, Minn. |
| 1954 | 30 | 8 | Argo, Ill., to Manhattan, Ill. |
| 1955 | 114 | 8, 10 | Humboldt, Kans., to Wichita, Kans. |

Also various short laterals were laid to serve terminals.

**THE AUTHOR**

Norman F. Tietze is division manager of the Twin Cities division of Standard Oil Co. (Ind.) products pipeline department located at Minneapolis. He spent 4½ years in the U. S. Army Corps of Engineers prior to employment in the engineering department with Standard in 1948. Since then he has held the positions of division engineer, district superintendent, and division superintendent.



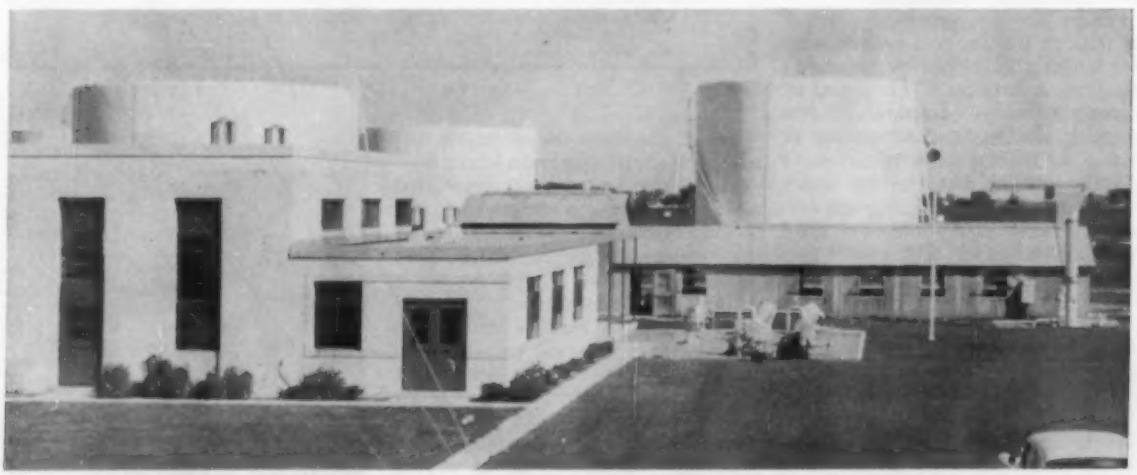

**PRODUCTS PIPELINE SYSTEM** of Standard of Indiana covers 2,330 miles with 20,000 available horsepower. Four of Standard's six refineries are interconnected—Neodesha, Sugar Creek, Whiting, and Mandan, along with 20 pipeline terminals, 1 bulk plant, 1 boat-loading dock, and 1 barge-loading facility.

the centralization of scheduling and dispatching in the Chicago general office. The product movement division coordinates pipeline movements from four refineries through the interconnected lines to most economically meet terminal requirements. The dispatching organization, a part of the product movement division, directs the movements of products to meet the established schedules. Dispatchers accumulate readings every 2 hours to retain the desired product control.

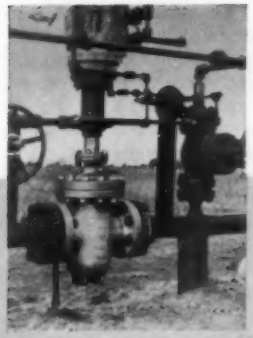
Desired voice and control channels are gained through the use of a company-owned microwave system from Moorhead, Minn., to Mandan, N. D., and leased-wire service over the remainder of the system.

Improved road and travel facilities have increased the efficiency of maintenance organizations to a point where assigned mileage has increased from less than 200 miles per crew to from 300 to 400. All eight such crews are equipped with standard maintenance and emergency machines, and in addition limited equipment to perform small construction projects.

Line patrol is delegated principally

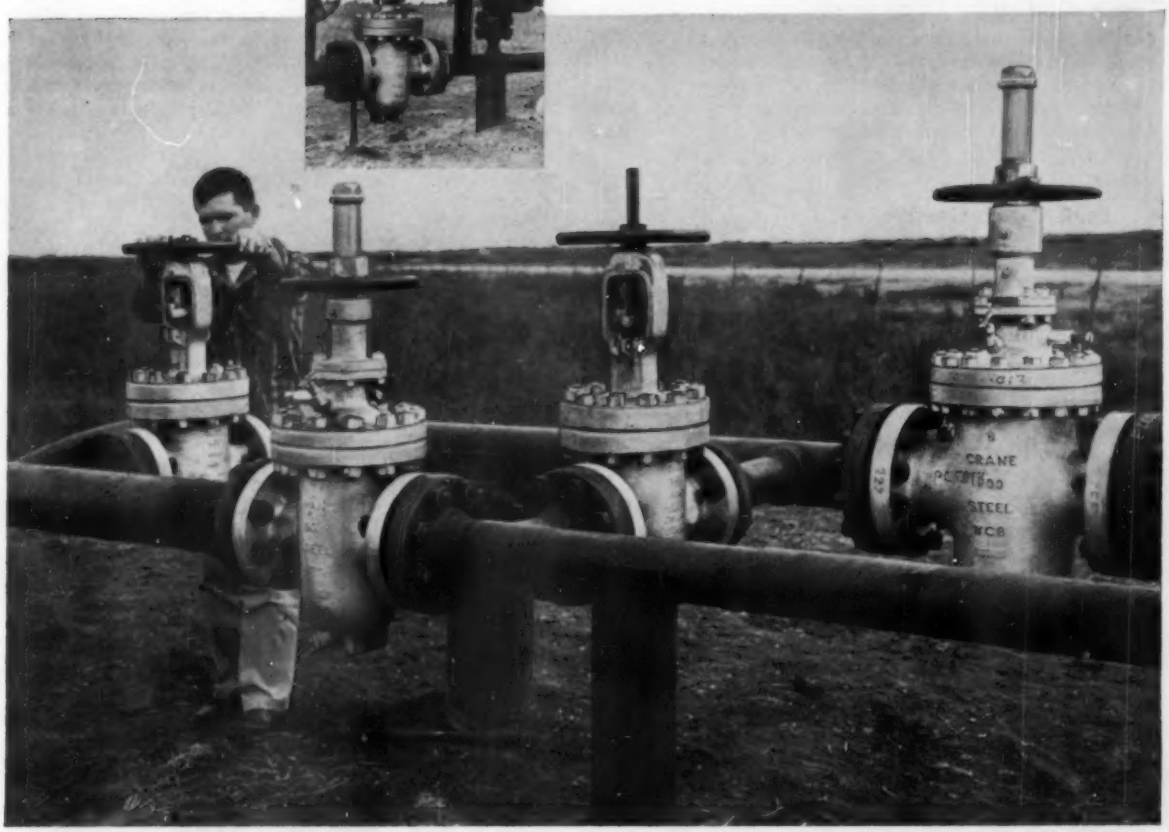


**MOOREHEAD STATION**, showing manifold and station buildings and tankage.



**Left**—Crane conduit-type valve with automatic operator at one of six stations.

**Below**—4- and 6-inch Crane conduit-type valves at scraper trap setting in 70-mile ethylene line.




# Ethylene Handled by Crane Conduit Valves in Phillips Chemical's 70-Mile Line

Phillips Chemical Company's ethylene pipeline from the Sweeny refinery to its Pasadena, Texas, plant crosses some 70 miles of rough, jungle-like country.

Valving for the line had to be specially designed to protect against product loss, and to insure safety.

All the line valves are new-type Crane conduit gates, Class 600 and Class 900. At six locations they are equipped with automatic operators. Should line leakage cause a pressure drop of 30 to 40 pounds, these valves will close automatically in 22 seconds. Other conduit valves are installed in the scraper trap settings.

Since they were installed a year and a half ago, these valves have operated without trouble of any kind. They close tightly and easily, and require no maintenance or periodic lubrication.

Both the *new* Crane conduit valves and the companion line of Crane double-disc pipeline valves are described in Crane Catalog AD-2198. A request to the address below or a call to your local Crane outlet will bring a copy quickly.

**ASK FOR CATALOG AD-2198**—Completely covers the new companion lines of Crane conduit-type and double-disc pipeline valves.

**CRANE VALVES & FITTINGS**

**PIPE • PLUMBING • KITCHENS • HEATING • AIR CONDITIONING**

*Since 1855—Crane Co., General Offices: Chicago 5, Ill.—Branches and Wholesalers Serving All Areas*

to one patrol plane for semimonthly inspection of all lines. In heavily populated areas where aerial patrol is less effective, small patrol crews are depended upon for line protection, limited maintenance, and operational jobs.

The patrol crews consist of from one to three men, depending upon area and duties assigned. Regular maintenance crews are still called upon for line patrol and contact duties. However, such occasions are infrequent and could be established on a semiannual average.

### Small Construction Projects

Small construction projects, such as station changes, manifold improvements, and line revisions for road and other construction, are performed by maintenance crews. Except for a small tractor for ditch, backfill, and high-lift purposes, no special equipment is owned for such work. Special equipment is obtained on a rental basis.

### Stations

The size of main and booster stations is dictated by the horsepower requirements to meet a specific need or capacity. When more than one unit must be used, versatility is incorporated into the design by using units of varying capacity. This versatility permits greater economy and improved control at other than maximum rates.

Whether stations are manned or can be controlled remotely depends principally upon the degree of product control which is required. As an example, at a main-line station where batches originate, economy may dictate a manned station due to existing network of interconnected supply lines.

In 1949 Standard built its first remotely controlled booster pumping station. Today Standard operates 11 pumping stations by remote control. Throughout this 9-year period much has been learned toward the successful application of control equipment and supervisory controls.

Progress in many cases has changed from the early-day heavy-duty diesel prime mover to the more efficient electric driver. However, today's modern diesel of the 600-hp. maximum class is in close competition with the electric-powered unit and must be considered for operating advantages not obtainable with an electric unit.

In many instances the electric-driven-unit installation for remote-control operation can be more economical. However, where maximum line pressures are required to maintain maximum line throughput during terminal takeoffs and product-gravity differences, the control problem becomes quite complex. The electric driver is a constant-speed unit. Load changes are limited to pump characteristics and whenever these conditions do not allow maximums desired, multiple-sized pumping units must be installed to fit the load changes.

Knowing that a pipeline system designed for capacity throughput requires booster stations located at various points along the line, it then becomes important to consider the type of prime mover to be installed for simplified and successful remote operations.

As in all remotely controlled facilities, starting sequences, i.e., motorized valves, units, etc., are actuated upon receipt of a proper signal. Shutdown protective devices guard against no flow, excessive temperature, high and low pressure, malfunction of critical equipment, and excessive leakage. Both electrical and diesel-powered remotely controlled stations are in use and regardless of climatic location both operate successfully. Here, again, economy usually establishes the type used.

### Terminals

Deliveries to most terminals are made in a conventional manner and are operated manually. However, remote-controlled deliveries are being made successfully. At one location telemetering is used to transmit desired information to the origin station.

In addition to starting sequences, which are basically similar to those of remote-controlled stations, the remote control of terminal deliveries also depends upon regulating flow rate, controlling line displacement, opening into proper tankage, positive shutoff in case of power failure, and means to prevent overfilling.

Flow is regulated at a predetermined value by flow raters or flow controllers. As the maximum rate is approached the flow-control device tends to restrict the flow, exerting greater pressure on the diaphragm of the pressure-reducing valve and thereby regulating the flow at the set valve.

Individual meters are installed for each product delivered and are equipped with set-stop counters. A counter is preset to run out at the desired delivery. When this quantity is reached the counter trips a microswitch attached to the counter linkage and thereby initiates the shutdown sequence. When a line displacement of another product is required, two settings are made. The first delivery in the amount of the displacement is run through its proper meter and closed out. A second run is then initiated to make the main delivery, again through an individual meter for a preset quantity.

Positive closeout in the event of power failure is accomplished either by placing a normally closed solenoid valve in the main line or adding solenoid valves to the control lines of the pressure-reducing valve to place it in a closed position when power failure occurs. The latter system requires that some tolerance can be permitted since reducing valves are not dependable to provide complete shutoff. A minimum of 2% leakage may be expected when using this method.

Various devices are available which successfully prevent overfilling a tank. One of the most dependable incorporates a liquid-level float which is attached through linkage to a normally closed mercoid. Product level above the installed point opens the mercoid circuit causing the closing sequence to start or solenoid valves to close.

Since Standard first entered the products-pipeline field it has aided in developing many improvements enjoyed by the industry today, as for example three types of automatic flash testers, and on others it has kept pace with the industry.

In later years, especially, this industry has set a great pace in expansion and progress, indicating that the greatest opportunities are still in the future.

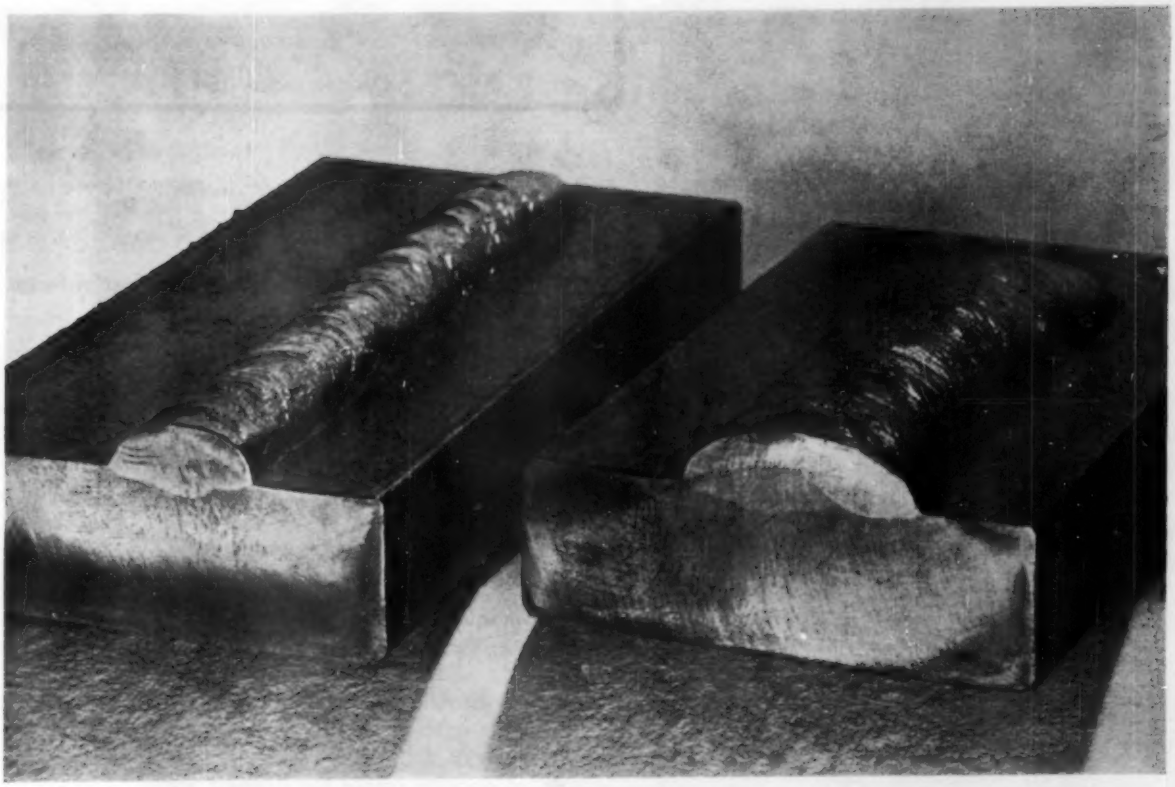
---

## Drilling line stored under leg brace

ONE CONTRACTOR found a neat place to keep his drilling line on his portable unit right under one of the leg braces.

He extended the main shaft and installed a cathead so that the line could be easily spooled up when the derrick was being laid down.

The cathead was made so that it lined up with the cathead on the draw works. Dividers were fixed so that the rope would wind freely.



*Two typical weld samples using Stoody Iron Powder Build-Up. At left is a stringer bead showing high build-up with a single pass. At right is a two pass weaving bead. Etched and polished ends show depth of penetration. Compare these results with your present build-up material.*

# Try New Stoody Iron Powder Build-Up

## *...then compare the build-up height!*

You can rebuild worn equipment faster and get sounder, tougher deposits with STOODY IRON POWDER BUILD-UP!

This new build-up electrode is a "natural" for use on parts made of carbon and low alloy steels. Deposits are tough, rigid, resistant to mushrooming and cold flow.

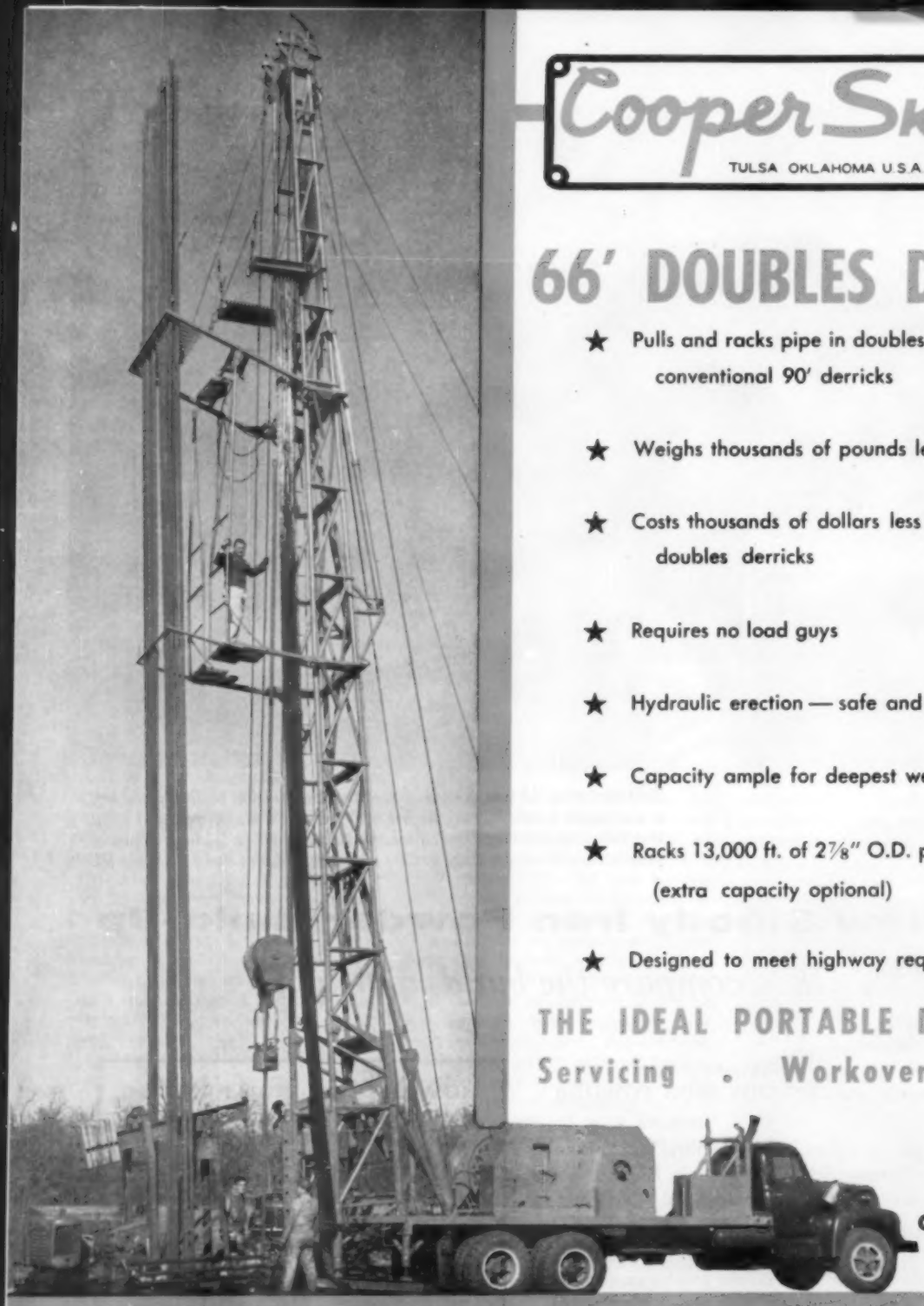
Most important, *hardness of deposits is not dependent on carbon, but is the result of STOODY BUILD-UP'S balanced alloy content!* This means greater uniformity and overall dependability of deposits—regardless of variations in base metal analysis.

Try IRON POWDER BUILD-UP today! Available from your Stoody Dealer (Check the Yellow Pages of your phone book) or write direct.

**HOW STOODY IRON POWDER BUILD-UP SOLVES TODAY'S BUILD-UP NEEDS:**

1. Makes high deposits in a single pass.
2. Lays down more pounds per hour at a lower cost per pound.
3. Deposits are tough and rigid, resistant to cold flow and deformation.
4. Provides strong support for overlays.
5. Won't spall, work-harden or crack.
6. Deposits will not exceed 45 Rc in hardness even when quenched.
7. Deposits are machinable.
8. Excellent weldability with minimum spatter and smoke.

**STOODY COMPANY**
**11960 E. Slauson Avenue**
**Whittier, California**



Cooper Skytop
TULSA OKLAHOMA U.S.A.

# 66' DOUBLES DERRICK

- ★ Pulls and racks pipe in doubles as fast or faster than conventional 90' derricks
- ★ Weighs thousands of pounds less and ....
- ★ Costs thousands of dollars less than conventional doubles derricks
- ★ Requires no load guys
- ★ Hydraulic erection — safe and fast rig-up
- ★ Capacity ample for deepest wells
- ★ Racks 13,000 ft. of 2⅞" O.D. pipe in doubles (extra capacity optional)
- ★ Designed to meet highway requirements

## THE IDEAL PORTABLE DERRICK FOR
## Servicing . Workover . Drilling

**See this Equipment at the Odessa Show**

Cooper Model "TR" truck powered Double Drum rig with Cooper Skytop Doubles Derrick.

Cooper Skytop
TULSA OKLAHOMA U.S.A.

FRED E. Cooper, Inc.

P. O. BOX 1890 TULSA, OKLA.

Branches: Houston, Odessa, Los Angeles, Olney

## How Cooper Skytop Works

The tubing is pulled a joint at a time, but it is racked in a doubles stand. By using an auxiliary elevator, along with power tongs, the connection is broken out while the traveling block is being lowered, and the stand is racked while pipe is pulled from the hole. With this system tubing is pulled, or run, as fast as the traveling block can be raised and lowered. THERE IS NO DELAY. It is similar to the rod-transfer system used in pulling and hanging sucker rods.

The derrick man attaches the transfer elevator to the tubing. This allows tubing stand to be racked independently from the traveling block and automatic elevators. It is similar to the popular Rod Transfer System.

### Skytop Patented Crown Block

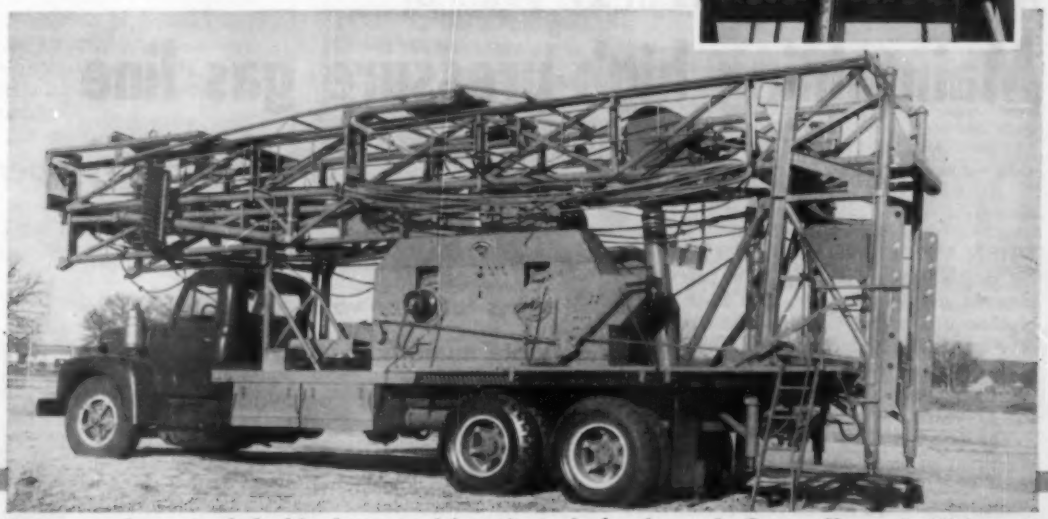
as shown is arranged with an opening which allows the "Double" Stands to pass through. The sheaves are 24" alloy steel, mounted on Timken bearings.

### Skytop Patented Traveling Block

has 22" alloy steel roller bearing mounted sheaves, and is designed with an opening corresponding to the crown. The tubing is supported within these openings, while being pulled.

### Skytop Automatic Elevators

are constructed similar to slip type elevators, except that slips are replaced by heavy dogs which engage the coupling. These dogs are manually locked in place to prevent any possibility of the elevator opening accidentally. The elevator stays on the pipe at all times.



Cooper truck powered double drum servicing rig ready for the road. Cooper Skytop is 35' long, 8' wide, and a maximum of 13'-3" high depending on winch unit.

**ORIGINATOR OF**
**Mobile Winch Units**

**FRED E. Cooper, Inc.**

P. O. BOX 1890 TULSA, OKLA.

Branches: Houston, Odessa, Los Angeles, Olney

REMOVAL of substandard 24-in. pipe from line of Natural Gas Pipeline Co. of America.

PIPE REMOVED from line prior to cleaning. Note effect of severe soil stress on the 27-year-old pipeline coating.

## Practices and results in 27 years of

# Maintaining high-pressure gas line

### *for top capacity operation*

1. Keep stress concentrations to a minimum.
2. Soil stress tests for value of coatings.
3. Adequate cathodic protection.
4. Fast replacement of removed corroded pipe.

BY DAVID C. PALM
Natural Gas Pipeline Co. of America

WHEN A PIPELINE has been in use for nearly three decades, each year presents new challenges. The 24-in. pipeline of Natural Gas Pipeline Co. of America, originating in the Texas Panhandle and terminating in the Chicago area, has operated continuously for 27 years.

The line has been maintained in a condition so as to operate at a maximum load factor and at the original discharge pressure of 712 psi. To extend this program into future years is, in simple terms, the problem of operating and maintaining a long-distance, large-diameter, high-pressure pipeline which has a long service record.

The solution of the problem lies in controlling the factors that can cause failure in the structure in the course of its operating life. Certain safety factors were built into this and every other well-designed transmission system. It is essential to preserve these original safety factors.

The art of designing and building a pipeline has advanced rapidly as the number of long lines has increased and the size of the lines has kept pace with the increasing demands for natural gas in the market areas.

Pipelines are designed to operate at a prescribed stress level expressed as a percentage of the yield point of the pipe metal. This requires that in the design and construction of a pipeline, any stress concentrations or secondary stresses be kept to a minimum. These factors have not stood out in as bold relief in past years as they do today

**REPLACEMENT PIPE** being welded into the line. In past 5 years 17,785 lineal feet of 24-in. pipe has been removed and replaced.

when operating stress levels are high with respect to the yield point.

During the 27 years of maintaining Natural Gas Pipeline's 24-in. pipeline, there have been no occasions where failure could be attributed to locked-up stresses imposed by backfill weight on improperly supported pipe or poorly fitted bends.

Removal of the metal of pipe walls by corrosion or electrolysis is the primary cause for lessening the useful life of a pipeline which has been in the ground for many years.

It is impossible to state the extent of corrosion losses which make a line unsafe. Obviously a pipeline system will have a better safety factor if corrosion is minimized. Experience and tests must guide operators on what is safe. Our company has had one rupture on this line attributable to electrolysis and there are other similar cases in the industry. The location and concentration of corrosion is the critical factor.

Pipeline coatings have been in use for several decades. However, the science and engineering of successfully protecting underground lines has been developed step by step over the years. The hazard of dissimilar soils was a theoretical idea until line currents caused electrolysis leaks in low-resistance areas.

Soil stress resistance as a test of successful pipeline coatings was an academic term for many years and not in the vocabulary of the practical man.

THE AUTHOR

David C. Palm, general superintendent of Pipelines for Natural Gas Pipeline Co. of America and Texas Illinois Natural Gas Pipeline Co., has spent his entire engineering career in the petroleum and natural-gas industry. A graduate of Standford University, he began work with the Cities Service organization in engineering and supervisory capacities. His experience includes a wide range of design and construction of oil and gas refining, processing, transmission, and measurement facilities. He has been in the employ of Natural Gas Pipeline in various capacities since the company was organized. He was advanced to his present position in 1952.

## FACTS about the line—how it grew and how it has been maintained

**Facts About the Line . . .** How it was built and how it has been maintained.

The Fritch, Tex.-Joliet, Ill. 890-mile, 24-in. line of Natural Gas Pipeline Co. of America has the reputation of being the first long high-pressure gas line. It pioneered modern high-pressure transmission.

Design for the 712 psi. operation of this line in the 1929-30 period was a big step ahead of the 400-450 psi. operation of other long lines being planned and built at that time.

**Pipe . . .** Approximately half of the 24-in. pipe was seamless furnished as the first delivery from a mill just completed by National Tube Division of U. S. Steel Corp. The remainder was A. O. Smith Corp. electric-flash-welded pipe. River pipe (18, 12 and 10-in.) came from National Tube and Jones & Laughlin Steel Corp.

Pipe was manufactured under company specifications. National Tube seamless was equivalent to 5L Grade "B"; minimum yield (from tests) 41,000 psi.; wall thickness $\frac{7}{16}$-in. A. O. Smith electric weld was equivalent to 5L Grade "A" minimum yield (from tests) 33,000 psi.; wall thickness 11/32-in.

**Couplings . . .** A special 24-in. Dresser coupling was developed and furnished to meet the high pressure requirements of the line. 59,000 couplings were purchased; 45,000 lb. tensile steel was used. One coupling in each 500 manufactured was assembled and tested with a gas pressure under water to 1,600 psi.

**Joining the joints . . .** National pipe was delivered in random joints averaging 32 ft. long. A. O. Smith pipe was 39 ft., 6-in. long for electric welded pipe; 24-in. pipe was double jointed on the right-of-way by welding. A small percentage was welded by oxyacetylene. Most of it was welded by electric arc welding with coated electrodes and welding rings. River pipe was solid welded by oxyacetylene welding.

For double jointing, pipe was rolled on skids or dollies while the welders worked on the top of the pipe. The double joints were connected in the line by Dresser couplings which have continued to serve on the line except at points where pipe has been removed for scrapping and reconditioning at times of replacement operations.

**Coating and wrapping . . .** The line was completely coated and wrapped from end to end.

Cleaning of pipe was done by hand with wire brushes.

Coating was done with regular and hot coal-tar enamel. It was poured on the pipe from a wide-spouted pouring can on double joints rotated by "roller rigs." Solid welded river pipe was hand coated with "granny rags."

A small percentage of the pipe was wrapped with asbestos felt. It was loosely applied by a modified squirrel-cage-type wrapping device while the pipe was rotated. This was applied where soil stress was most severe.

**Pipelaying . . .** Overland pipe was laid with no slack in the line because of the couplings. River crossings were solid welded and laid with slack. The line was built in 15 months between July 1930, and September 1931.

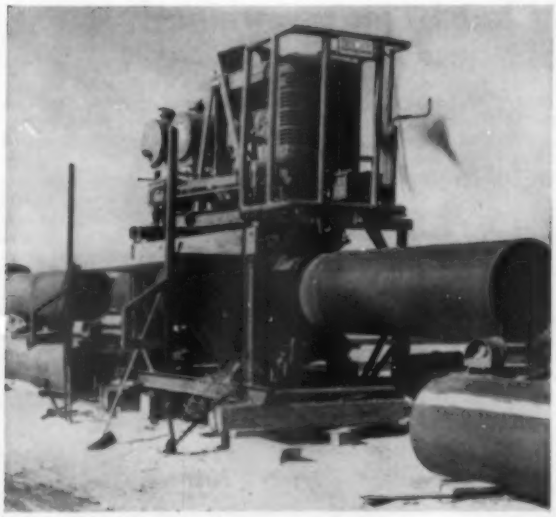
**Cathodic protection . . .** Pilot operations with cathodic protection started in 1939. Wind-driven and gas-engine driven generators as well as zinc and magnesium anodes were used in the early work. In 1947 the entire line was cathodically protected with a program which used rectifiers extensively. Today the line is protected entirely by rectifiers except in a few small areas where magnesium anodes are used.

**Testing, maintenance, expansion . . .** No hydrostatic testing has been done yet (except in compressor station piping) on the original Fritch-Joliet 24-in. line of Natural Gas Pipeline. Some pipe has been hydrostatically tested in the Texas Illinois Natural Gas Pipeline Co. system in areas that have become populated since it was originally built in 1951.

Soil-erosion control has been an important part of the company's program for avoiding exposure of the pipe and for minimizing stress concentrations. Pipe has been replaced at many creek crossings which lacked sufficient cover originally and wherever weak spots have been identified. Shut-outs for replacement work are usually scheduled for week ends.

The longest period of uninterrupted service was from 1951 to 1958.

The original 24-in. line is completely paralleled by a 26-in. line laid in a looping program extending over a period of years as the load factor for the system climbed. This year the system is being paralleled again by a 36-in. line (now under construction). Now after 27 years service, no extensive reconditioning appears to be urgent. If the pipe had been laid bare without coating, considerable reconditioning would probably have been necessary after the first 10 years.



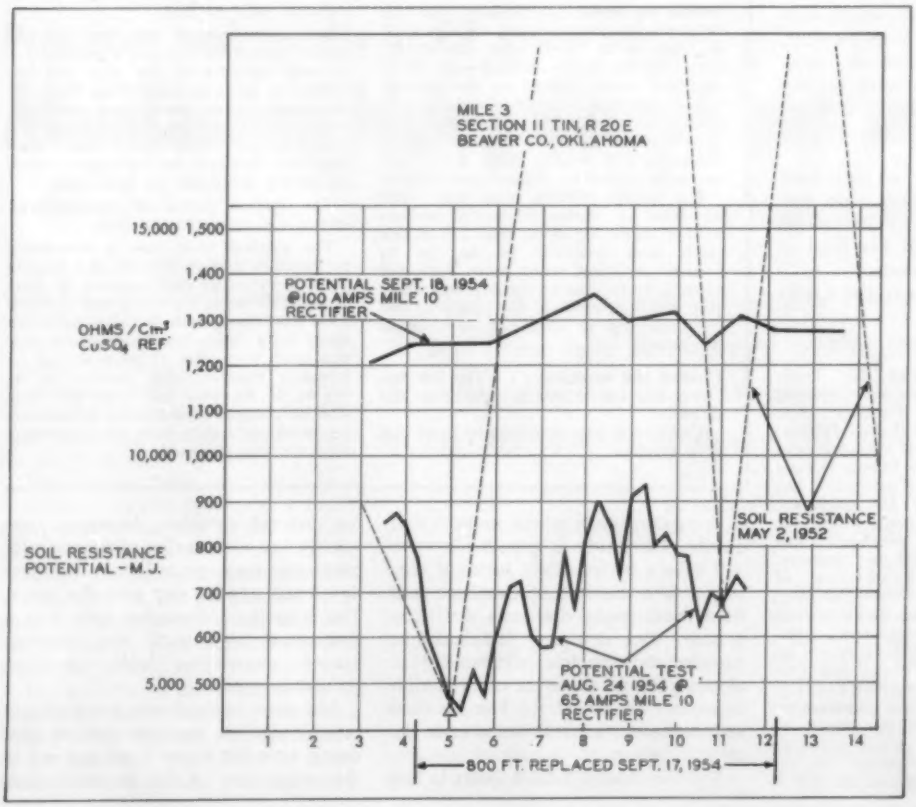
**STATIONARY CLEANING MACHINE** removing soil and old coating from reclaimed pipe.

**SECTIONS** of 24-in. pipe removed from line after 27 years of service. Pitted sections were scrapped.

Many of the older pipelines had very inadequate corrosion protection when compared to present-day pipelines. Today well-designed coatings are supplemented by cathodic protection.

On our system, belated cathodic-protection installations are giving good protection. This is accomplished in spite of excessive current requirements and problems of current distribution due to poor coatings. The pipeline under discussion was laid in 1930 and 1931 and, by the then prevailing standard was well protected by coal-tar enamel. However, it began showing an increasing leakage frequency 15 years later. Cathodic protection by rectifiers on the 890 miles of main line has reduced this leakage to one per year in 60 miles of pipeline.

Keeping abreast of the true condi-




**GRAPHIC** illustration of the step up in efficiency of cathodic protection in low-soil-resistance areas following replacement of poorly coated and pitted pipe with new well-coated pipe.

## One man can easily lift three 20-foot lengths of 4" pipe of Tenite Butyrate

# 92% lighter than cement-lined metal pipe

The approximate weight of a bundle of three 20-foot lengths of 4" pipe made of Tenite Butyrate is only 60 lbs. Cement-lined steel pipe, commonly used for the same purpose, would weigh approximately 720 lbs.

Because this plastic pipe is so light, it is extremely easy to handle. What's more, it can be cut with a hand saw and joined quickly with only slip-sleeve couplings and solvent cement. As a result, pipe made of Tenite Butyrate can be installed faster and easier. A crew of three men can lay 4,000 feet of 4" pipe in only one working day.

And pipe made of Tenite Butyrate is *tough*. It can take rough handling, and all normal back-filling operations.

Once in service, pipe of Tenite Butyrate remains free of corrosion—by sour crudes, salt water and alkali soils. Its smooth interior surface provides as much as 40% greater flow volume for any given head loss than does clean metal pipe of the same diameter. Moreover, this smooth surface offers no toe-hold where paraffin can start accumulating.

Could pipe with so many advantages help you in your operations? We will be glad to send you additional information about the properties and applications of pipe made of Tenite Butyrate and also the names of companies that produce the pipe and a complete range of fittings. Address: EASTMAN CHEMICAL PRODUCTS, INC., subsidiary of Eastman Kodak Company, KINGSPORT, TENNESSEE.

**TENITE**
**BUTYRATE**
*an Eastman plastic*

*A 16-mm. sound-color film, "PLASTIC PIPELINES," is available upon request.*

**WELDING PITS** in reusable reclaimed pipe following sandblasting operations.

tion of a pipeline which has been in the ground for many years and falls in the old-line classification is the first step in setting up a thorough maintenance program.

A retest of a line to the original test pressure, and somewhat above the operating pressure has much to recommend it. The yield point of the steel should be the controlling factor for test pressures. The purpose of such a test would be to reestablish the adequacy of the pipeline after years of service to operate under the pressures for which it was originally designed.

Hydrostatic testing here has the advantage over gas testing by eliminating gas losses in case of leaks or ruptures. It also has a distinct advantage from the standpoint of safety if there are any indications of weaknesses.

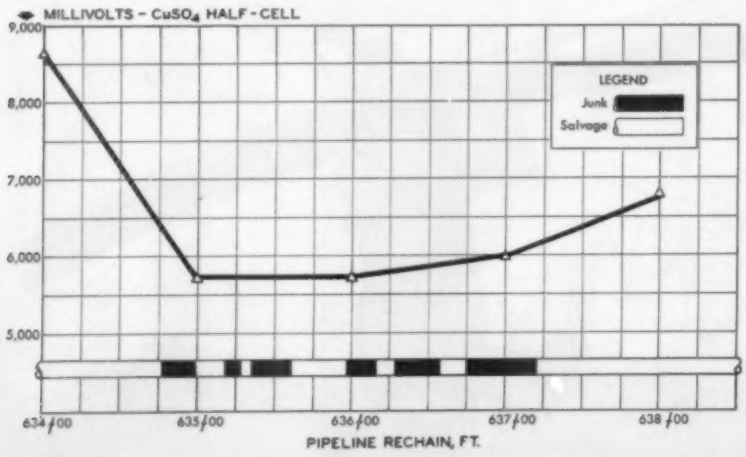
If operating conditions do not permit taking a line out of service for an extended period of time as is required for a retest program, it is necessary to devise a method for locating potential weaknesses while the line is in service.

On the Natural Gas Pipeline's system, three criteria have been used for such determinations. The first is the leak history of a section of line. If there have been an excessive number of leaks in an area it is indicated that remedial steps are in order.

The second is a study of soil resistance. Soil-resistance data have been taken on the entire 890-mile length of the pipeline at 200-ft. intervals. If the soil resistance is in the lower ranges such as 1,000 ohms per cc. it may indicate that any accumulated line currents have escaped into the soil in that area prior to the installation of cathodic protection. These are areas of possible excessive pipe corrosion.

The third indicator for excessive corrosion is a low pipe-to-soil potential with the cathodic-protection system in operation. An attempt is made to maintain a protection level of 850 mv. negative to a copper sulfate reference half cell. Any level which is appreciably less bears checking. A combination of these indicators has proven quite reliable in identifying the areas where pipe is so badly corroded that it should be removed.

Exposing the pipeline for spot checks is not, in our experience, a completely reliable method for checking corrosion deterioration. Soil variations can easily distort the findings. It is also a more expensive method of investigation.




**PLOT** of reclaimed pipe compared to copper sulfate potential readings on section of 24-in. pipeline, Barton County, Kansas. Potential readings taken prior to pipeline removal.

### Replacing Bad Pipe

When the pipeline sections which need rehabilitation have been pinpointed a shutout of the line must be arranged with the dispatching department at a time when load conditions are favorable. In our case a parallel line has permitted up to a 3-day shutout when a length of a half mile of line has been replaced.

The procedure has been to weld and coat the replacement pipe in about 200-ft. lengths prior to the installation. A bend survey permits making up bends in advance. When the line is shut out, a number of back hoes strip the line. It is torch cut into lengths convenient for removal. Clamshell buckets and handwork ready the trench for the replacement.

In the past 5 years a total of 17,785 lineal feet of 24-in. pipe has been removed and replaced in the main line either with new pipe or completely reconditioned pipe. The footage removed from a location has varied from 240 ft. to a half mile. There was a total of 22 removal jobs.

The removed pipe was run through a cleaning machine, then its condition was checked. Reusable pipe was cut out and sandblasted as part of the reconditioning process if it did not have an excessive number of deep pits. This method exposed and cleaned out the pitting to facilitate spot welding.

An indication of the reliability of the survey for replacing pipe in the line is the fact that only 38% of the pipe removed over the 5-year period was suitable for reconditioning. Thus 62% of removed pipe was scrapped.

Pipeline operators are necessarily interested in the ultimate life of a high-pressure pipeline. The means for a long continuation of the operation of a line such as that of Natural Gas Pipeline Co. of America is probably a combination of two programs. These are complete replacement of pipe in areas of severe corrosion and a retest program of other areas to eliminate weaknesses of a localized nature.

## Here's a short cut—solve those

# True combination angles for pipeline bends by spherical trigonometry

BY JOHN H. REAGAN
Engineer, Interstate Oil Pipe Line Co.

PIPELINE ENGINEERS have run into many situations where it was necessary to connect two sections of pipe with a bend that was neither in the vertical plane nor the horizontal plane. Usually this situation is found in congested areas where space is very limited.

This substitution of a single combination bend for a horizontal bend and a vertical bend can be easily done by computing a single true combination angle and fabricating a bend from this angle. It is usually necessary to weld a short length of straight pipe to each end of the combination bend in order that it may be easily cut and fitted into place without changing the computed angle.

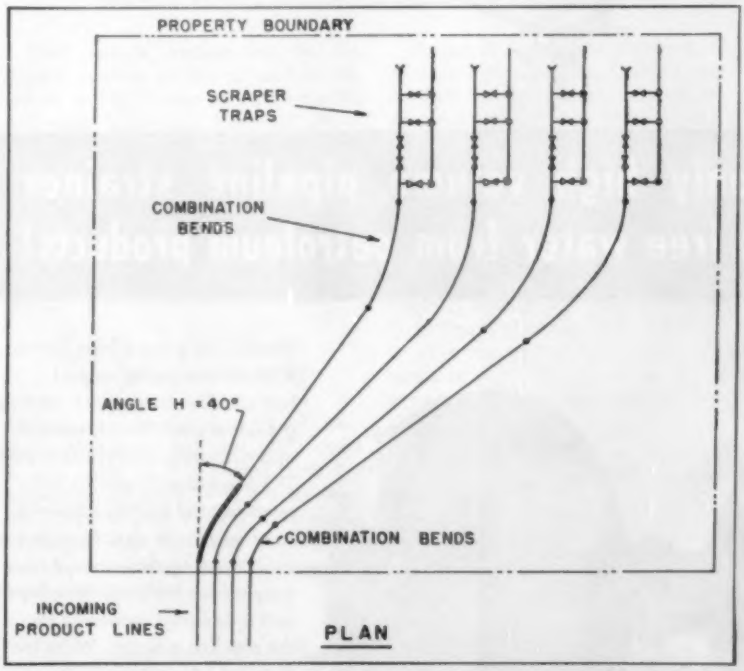
This was the situation in the Baton Rouge, La., area when Interstate was required to connect four lines in a common ditch to four scraper traps above grade. The position of the scraper traps and limited working area prevented the connection of the traps with normal vertical bends to get out of ground and horizontal bends to enter the scraper traps. (See Figs. 1 and 2).

The most-used method for computing the combination angle is by solid geometry. However, this method is rather long and slightly tedious. This combination bend is actually a single smooth curve or bend in three dimensions. The computation of such curves from known vertical and horizontal angles is easily done by spherical trigonometry which is concerned with the application of the theory of plane-trigonometric functions to problems of geometry on a sphere.

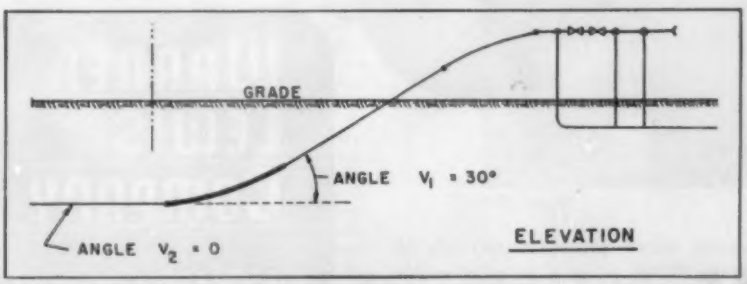
The principal use of spherical trigonometry is the application of methods and results to problems of navigation and astronomy. However, it has other uses, one of which is the subject of this article.

In order that a single case may be presented that will fit any problem, vertical angles, both positive and negative and other than zero, are shown in Fig. 3. In Fig. 3, the pipe enters the sphere at the left with an upward slope $V_2$ with respect to A, which is the horizontal plane representing the earth's surface. Since the slope of the pipe is up, $V_2$ is positive.

Angle H, measured at the zenith point, is the amount of turn that the pipe must make in the horizontal plane. Leaving the bend, the pipeline goes down at an angle $V_1$, which is negative. By extending the left-hand pipe section through the sphere, a spherical triangle is formed with all the angles required in the formulas less than 90°. Angle C is the resultant true combination angle.



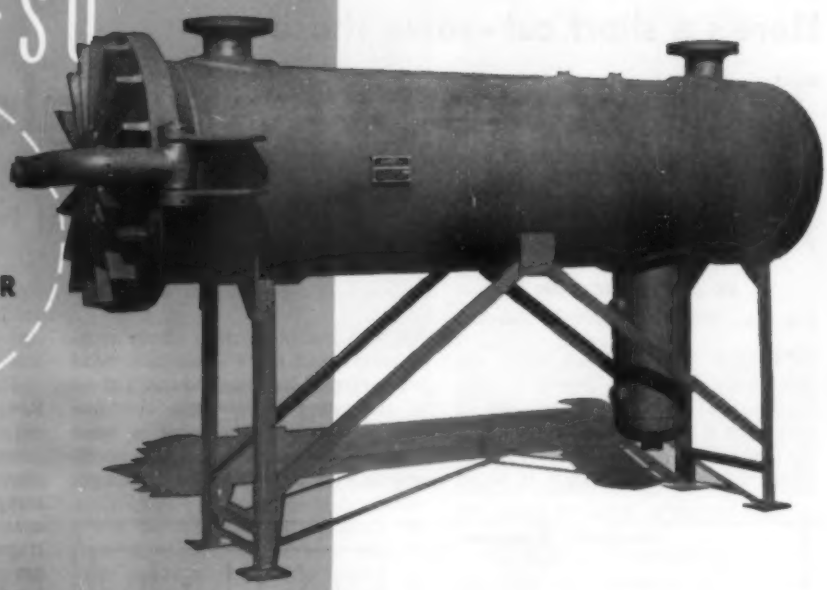

**HORIZONTAL ANGLE**, the turn pipe must make in horizontal plane, is 40°. Fig. 1.



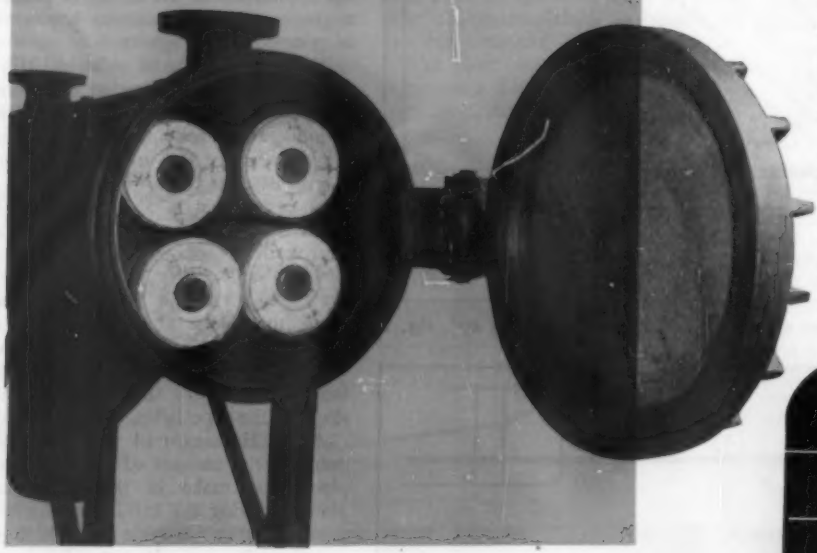

**ELEVATION ANGLE** to connect incoming line to straight section of pipe is 30°. Fig. 2.

# EXCEL-SO

**HP-700**
**CLUSTER**
**REPACK**
**SEPARATOR**
**STRAINER**



**. . . the only high volume pipeline strainer that removes free water from petroleum products!**

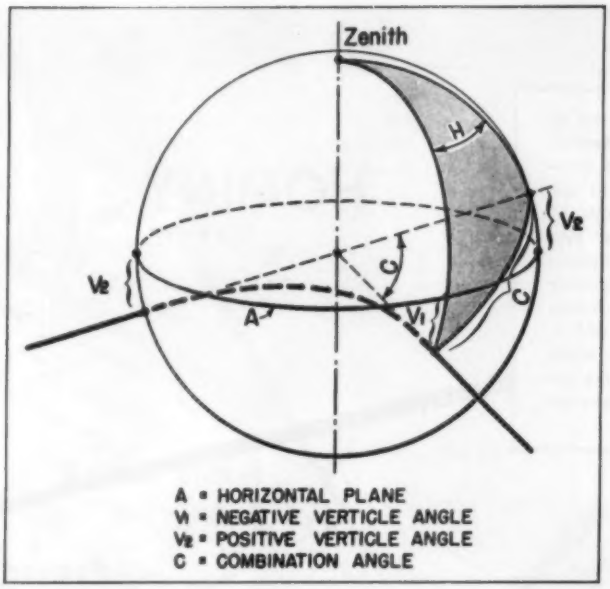


The HP-700 is rated from 750 to 1000 GPM on gasoline and fuel oil. The four repack cartridges provide a total filtering area of approximately 5,500 square inches. This Separator-Filter effectively removes solid particles down to forty microns in size. Equipped with quick opening closures and other easy service features, this compact unit is designed especially for the pipeline industry. Write for detailed information.

**WARNER LEWIS COMPANY**

BOX 3096 • TULSA, OKLAHOMA

DIVISION OF **FRAM** CORPORATION




**VERTICAL ANGLES**, positive and negative, are shown. Fig. 3.

The triangle, represented by the shaded portion on the surface of the sphere in Fig. 3, can be solved by the following formulas. Rigorous proof of the formulas may be had by referring to Ageton's method for solution of spherical triangles in any standard text on spherical trigonometry.

$$\text{Cos } C = \text{Cos } R \text{ Cos } (K - V_1)$$

where

$$\text{Sin } R = \text{Cos } V_2 \text{ Sin } H$$
$$\text{Sin } K = \text{Sin } V_2 / \text{Cos } R$$

all angles are less than 90°

Since the horizontal angle H will normally always be less than 90°, angle K and angle $V_2$ will always have the same sign. If angle H is greater than 90°, then K and $V_2$ will have opposite signs. It is important that K, $V_1$, and $V_2$ be assigned correct signs and used algebraically.

**THE AUTHOR**

John H. Reagan joined Interstate Oil Pipe Line Co. as an engineer in June 1957. He was graduated from the U. S. Naval Academy with a B.S. in Naval Science in 1950, having previously studied engineering at Southwestern Louisiana Institute and University of Texas. After 6 years in the Navy as electronics officer, maintenance officer of a jet fighter squadron, and a flight instructor, he resigned from the Navy as a lieutenant senior grade in 1956 to launch his engineering career.

Angles R and K (not shown on Fig. 3) have a meaning in Ageton's method, but for this article, they are used as constants for easy solution of the problem.

A value of 20° is given to angle $V_2$ which would represent a pipeline inclined toward the vertical with respect to the ground of 20°. Then turn the pipeline 30° in a horizontal plane represented by the earth's surface. Thus, angle H equals 30°. Finally, the pipe is inclined vertically downward as if it were reentering the ground at an angle of 40°. This is angle $V_1$ and equals —40° because the downward slope is negative.

Thus, we have $V_1 = -40°$; $V_2 = +20°$; and $H = 30°$. Applying the formulas:

$$\text{Sin } R = \text{Cos } V_2 \text{ Sin } H$$
$$= \text{Cos } 20° \text{ Sin } 30° = 0.470$$
$$R = 28°$$

$$\text{Sin } K = \text{Sin } V_2 / \text{Cos } R$$
$$= \text{Sin } 20° / \text{Cos } 28° = 0.387$$
$$K = 22.8°$$

Since angle $V_2$ is positive and angle H is less than 90°, angle K is positive.

$$\text{Cos } C = \text{Cos } R \text{ Cos } (K - V_1)$$
$$= \text{Cos } 28° \text{ Cos } [(22.8° - (-40°)]$$
$$= \text{Cos } 28° \text{ Cos } 62.8° = 0.403$$
$$C = 66.2° = \text{The true combination angle}$$

At the project in the Baton Rouge area, two combination bends were used to connect each scraper trap as indicated by Fig. 1 For purposes of

## Construction

simplification, only one bend will be studied and with assumed angles. The incoming product lines are buried approximately 3 ft. deep, and the scraper traps are aboveground, say 2 ft. high. Each combination bend is connected by a straight section of pipe.

We are concerned first with the elevation angle to connect the incoming product line to the straight connecting section of pipe. Let us call this angle $V_1$ and assume it is 30° (See Fig. 2). The next angle of concern is the horizontal angle, or the amount of turn that the pipe must make in the horizontal plane, which we will call angle H and give it a value of 40° (See Fig. 1).

The only other angle that we need to know is the vertical angle which is represented by the inclination of the incoming product lines with respect to the earth's surface. Let us call this angle $V_2$ which is 0°. Again, the slope of the vertical angles is very important. If the slope of any angle is up with respect to the earth's surface, the vertical angle is positive; if the slope is down, then the angle is negative. Since these signs are used algebraically in the formulas, it is necessary that they be assigned correctly.

In our problem, $H = 40°$; $V_1 = +30°$; $V_2 = 0°$

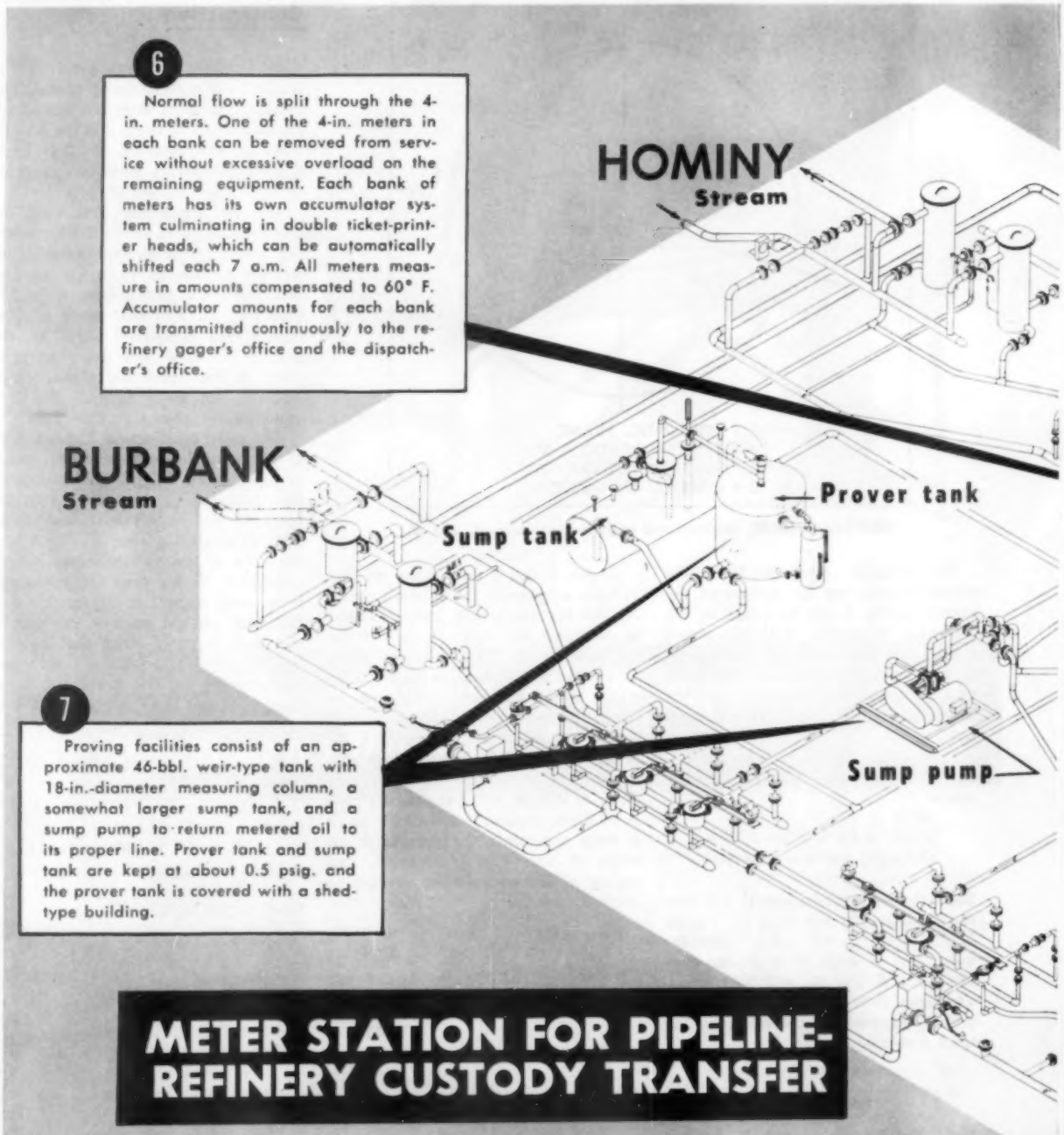
$$\text{Sin } R = \text{Cos } V_2 \text{ Sin } H$$
$$= \text{Cos } 0° \text{ Sin } 40° = 0.642$$
$$R = 40°$$

$$\text{Sin } K = \text{Sin } V_2 / \text{Cos } R$$
$$= (\text{Sin } 0°)/(\text{Cos } 40°) = 0$$
$$K = 0$$

$$K - V_1 = 0 - 30° = -30°$$

$$\text{Cos } C = \text{Cos } R \text{ Cos } (K - V_1)$$
$$= \text{Cos } 40° \text{ Cos } (-30°)$$
$$= 0.654$$
$$C = 48.5° = \text{True combination angle}$$

Now that the combination angle is known, it is necessary to know only the desired radius of the bend to be able to obtain by simple mathematics all the information about the bend that is needed. A short piece of straight pipe can then be welded to each end of the bend if desired in order to facilitate cutting and welding into place. Anyone who has solved a true combination angle in terms of solid geometry can readily appreciate how much easier it is to set up and solve the same problem in terms of spherical trigonometry.


6
Normal flow is split through the 4-in. meters. One of the 4-in. meters in each bank can be removed from service without excessive overload on the remaining equipment. Each bank of meters has its own accumulator system culminating in double ticket-printer heads, which can be automatically shifted each 7 a.m. All meters measure in amounts compensated to 60° F. Accumulator amounts for each bank are transmitted continuously to the refinery gager's office and the dispatcher's office.
HOMINY
Stream
BURBANK
Stream
Prover tank
Sump tank
7
Proving facilities consist of an approximate 46-bbl. weir-type tank with 18-in.-diameter measuring column, a somewhat larger sump tank, and a sump pump to return metered oil to its proper line. Prover tank and sump tank are kept at about 0.5 psig. and the prover tank is covered with a shed-type building.
Sump pump

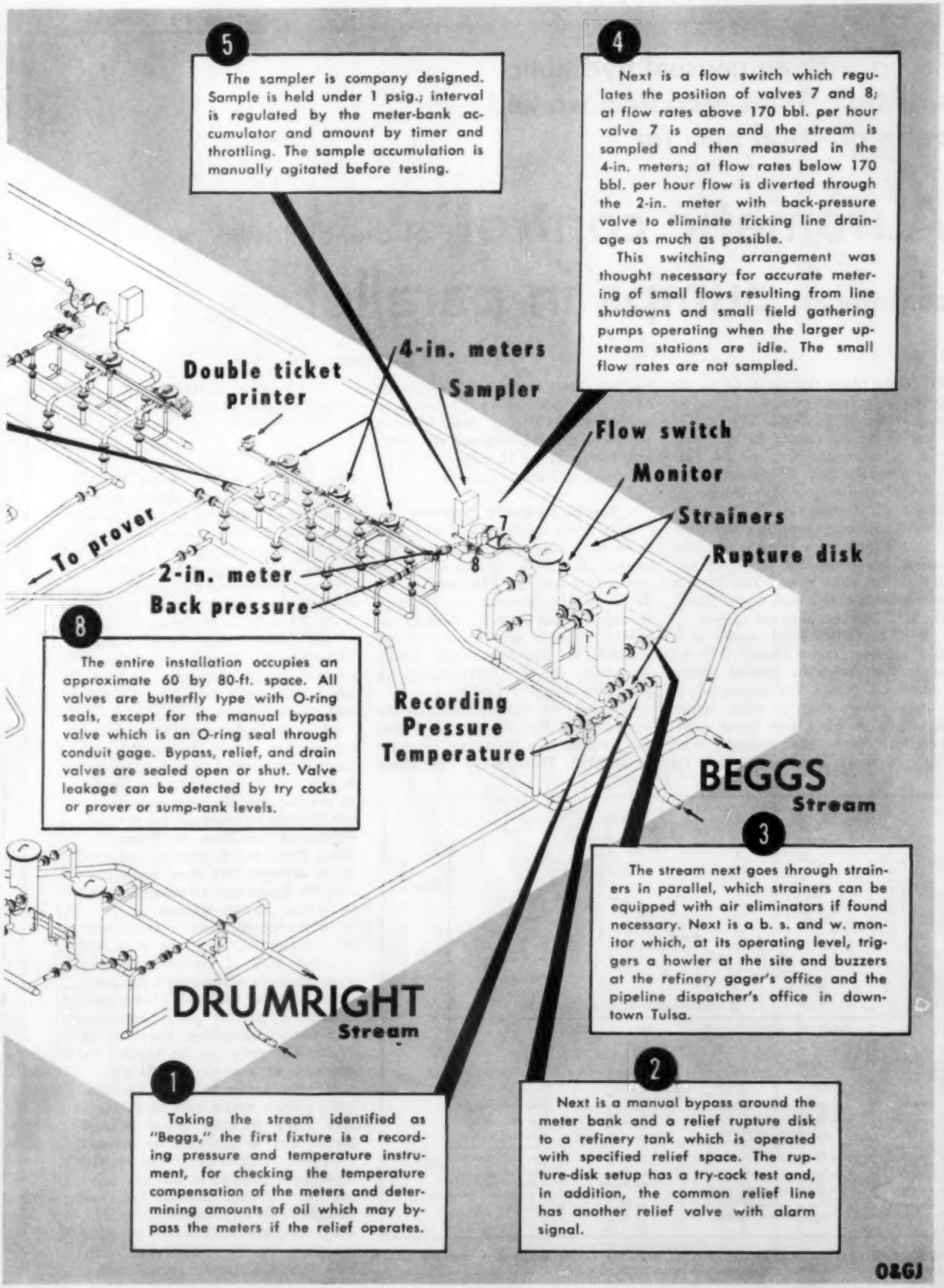
# METER STATION FOR PIPELINE-REFINERY CUSTODY TRANSFER

BY FRED E. PYEATT, JR.
Manager, Engineering Dept.
Mid-Continent Pipe Line Co., Tulsa

THE METER STATION of Mid-Continent Pipe Line Co. at DX-Sunray Oil Co.'s West Tulsa refinery is going through its test runs prior to regular operation for custody transfer of crude.

The accompanying layout shows how four separate streams are metered before going to separate or common refinery crude charge tanks. Meter banks are identical except for size of line and number of meters.

Initial test runs are satisfactory so far, with only minor troubles with components of the installation. Substantial savings are expected in both pipeline and refinery operations as a result of replacing manual gaging of stock tanks with metering for custody transfer.


5
The sampler is company designed. Sample is held under 1 psig.; interval is regulated by the meter-bank accumulator and amount by timer and throttling. The sample accumulation is manually agitated before testing.
4
Next is a flow switch which regulates the position of valves 7 and 8; at flow rates above 170 bbl. per hour valve 7 is open and the stream is sampled and then measured in the 4-in. meters; at flow rates below 170 bbl. per hour flow is diverted through the 2-in. meter with back-pressure valve to eliminate tricking line drainage as much as possible.
This switching arrangement was thought necessary for accurate metering of small flows resulting from line shutdowns and small field gathering pumps operating when the larger upstream stations are idle. The small flow rates are not sampled.
4-in. meters
Sampler
Double ticket printer
Flow switch
Monitor
Strainers
Rupture disk
To prover
2-in. meter
Back pressure
7
8
8
The entire installation occupies an approximate 60 by 80-ft. space. All valves are butterfly type with O-ring seals, except for the manual bypass valve which is an O-ring seal through conduit gage. Bypass, relief, and drain valves are sealed open or shut. Valve leakage can be detected by try cocks or prover or sump-tank levels.
Recording
Pressure
Temperature
BEGGS
Stream
3
The stream next goes through strainers in parallel, which strainers can be equipped with air eliminators if found necessary. Next is a b. s. and w. monitor which, at its operating level, triggers a howler at the site and buzzers at the refinery gager's office and the pipeline dispatcher's office in downtown Tulsa.
DRUMRIGHT
Stream
1
Taking the stream identified as "Beggs," the first fixture is a recording pressure and temperature instrument, for checking the temperature compensation of the meters and determining amounts of oil which may bypass the meters if the relief operates.
2
Next is a manual bypass around the meter bank and a relief rupture disk to a refinery tank which is operated with specified relief space. The rupture-disk setup has a try-cock test and, in addition, the common relief line has another relief valve with alarm signal.
O&GJ

## Faced with an unusual hydraulic situation, Trans Mountain worked out a practical plan for

# Automatic control of diesel-driven centrifugal pumps in parallel

BY K. L. HALL
Acting general superintendent, Trans Mountain Oil Pipe Line Co.

AUTOMATIC CONTROL of diesel-driven centrifugal pumps is common in pipeline applications. The engine speed is set to match the pumping rate to the requirements of the line. This is usually done by pneumatically operated engine governors loaded by an air signal generated in flow, suction, or discharge-pressure controllers.

In multiunit stations, identical pumps are connected in series and run at the same speed. This insures a reasonable distribution of the pumping load between units on stream.

With high static-head conditions it may provide greater flexibility to arrange the pumps in parallel. When centrifugal pumps are connected in parallel rather than in series, minor variations in speed have much greater effect on the load balance. With the governors commonly used on modern diesel engines, speed control alone will not suffice to insure a proper distribution of load between pumps in parallel. This was the problem facing Trans Mountain Oil Pipe Line Co. in western Canada.

### Special Hydraulic Problems

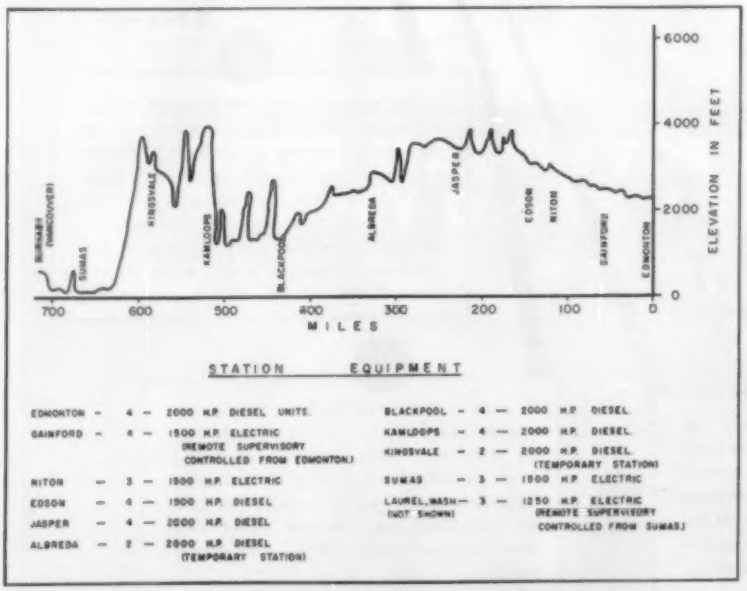
This 24-in. crude-oil line runs 716 miles from Edmonton, Alta., to Vancouver, B. C. A 48-mile spur line serves Ferndale and Anacortes, Wash. With two 51-mile loops and 11 pump stations, it has a daily capacity of 250,000 bbl. It was the first major pipeline to cross both the Rocky Mountains and the Coast Range. A profile is shown in Fig. 1.

Starting from Edmonton, at an elevation of 2,263 ft., the pipeline crosses the Rockies at a maximum elevation of 3,950 ft. Through the Yellowhead Pass, and the valleys of the Fraser and North Thompson rivers, it descends to an elevation of 1,100 ft. at Kamloops, B. C. South of Kamloops the line rises steeply to a 4,000-ft. plateau on the approach to the narrow and precipitous Coquihalla Pass through the Coast Range. Here it drops 3,600 ft. in less than 30 miles to the broad, lower Fraser Valley. These drastic changes in elevation caused special hydraulic problems which influenced both pump-station and pipeline design.

Much study has been given to the comparative merits of parallel and series arrangements of station pumps. It was finally determined that pumps in parallel was the most economical and flexible arrangement for the high static-head condition at Edmonton, Black Pool, and Kamloops, and that series arrangements were more suitable for Edson and all subsequent intermediate booster stations.

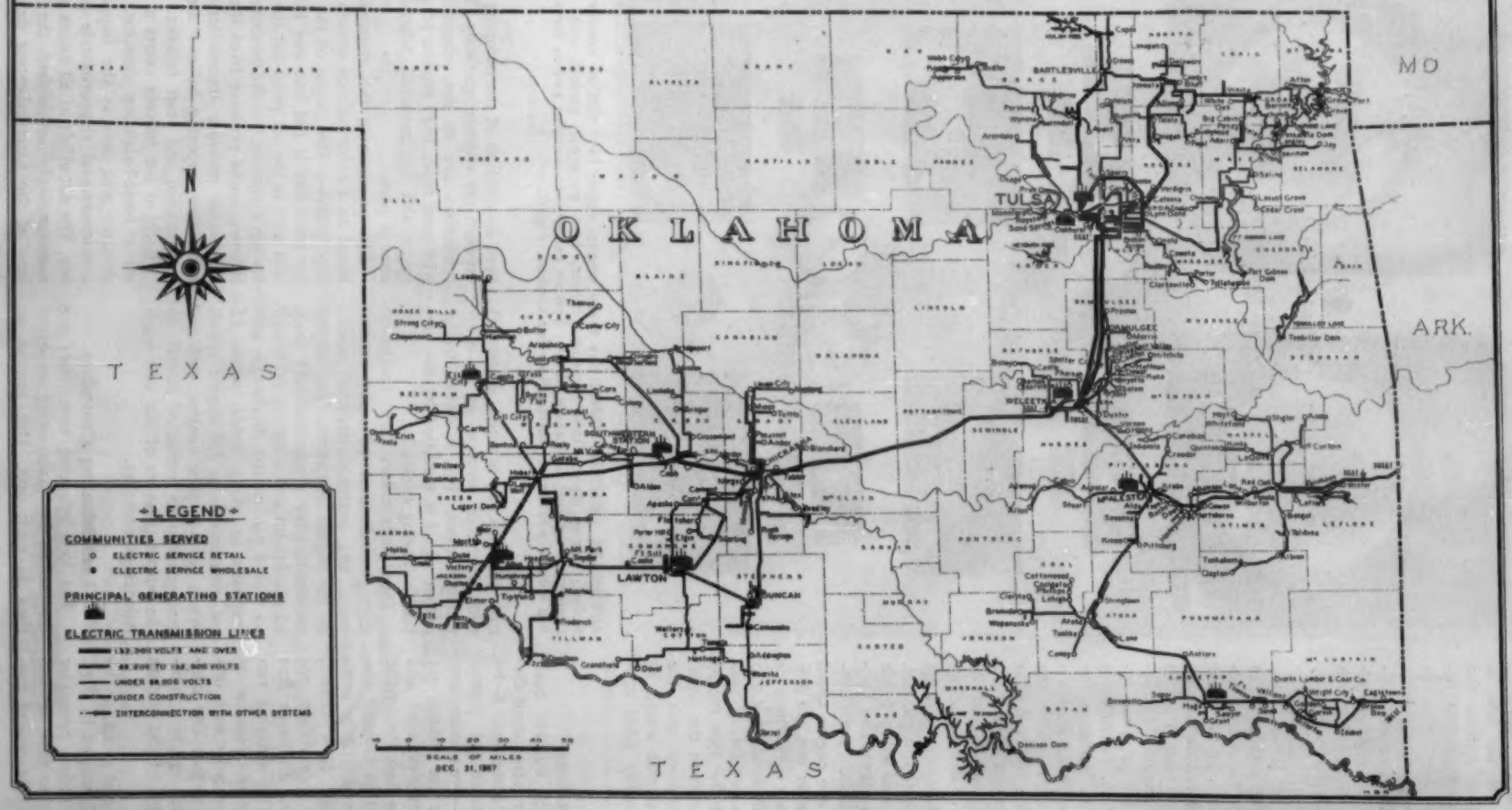
At Edmonton, with a throughput of 120,000 bbl. daily, the static lift is about 45% of the total pumping load. Similarly at Kamloops, the static lift is 65% of the load. Under such conditions, parallel pump operation is a distinct advantage. Flows up to 75,000 bbl. daily can be handled by operation of a single parallel unit.

If series pumps had been installed, two of them would have to be operated either throttled or at reduced speeds and at considerably reduced engine efficiencies. The initial throughput demand of the line could not be predicted closely, but was thought likely to be about 60,000 bbl. daily. Original construction provided for flows up to 150,000 bbl. daily with the four stations named above.




**PROFILE** of first major pipeline to cross both the Rocky Mountains and the Coast Range, from Edmonton, Alta., to Vancouver, B. C. Fig. 1.

# PUBLIC SERVICE COMPANY OF OKLAHOMA SYSTEM




# INVITATION TO SERVICE...

We cordially invite you to call on us for information on costs and availability of electric service in Oklahoma and for consultation on any electrical problems you may have. Phone CH 2-6171 or write Public Service Company of Oklahoma, B. F. Thompson, Sales Department, Mezzanine, 6th and Main, Tulsa 2, Oklahoma, or the Area Sales Manager in these Public Service Company headquarter towns: Bartlesville, Vinita, Okmulgee, McAlester, Hugo, Duncan, Lawton, Chickasha, and Clinton.

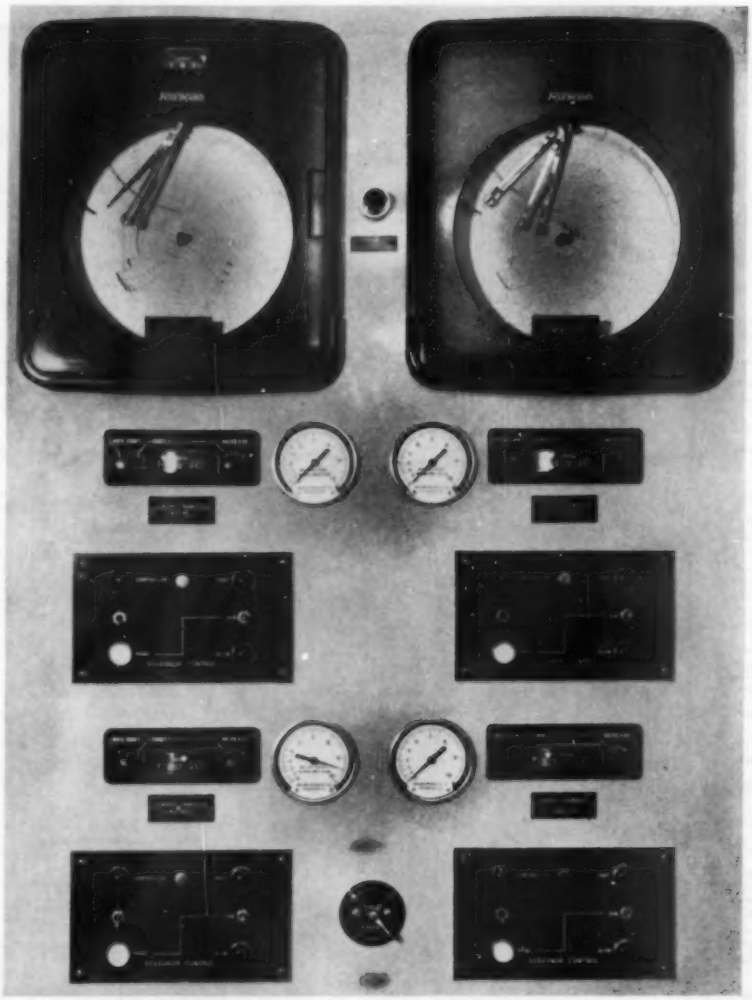
**DEPENDABLE ELECTRIC POWER FOR ALL BRANCHES OF THE OIL BUSINESS!**

### Automatic-Control Problem

After construction of the line, a decision was reached to operate the line "tight-line" at some suitable future date, but to provide for automatic control of the pumping units immediately. The automatic load-balancing of multiunit, parallel, diesel-driven pumps was a problem which had not been encountered previously in tight-line operation of big-inch stations.

With identical pumps connected in series, the load can be balanced readily by running the units at the same speed. The percentage unbalance cannot exceed $(1 + n)^2$ where n is the maximum percentage engine-speed deviation permitted by the governor under constant air loading. Isochronous governors will set and maintain the engine speed to within plus or minus 2% of the speed called for by the controller. Even if the full variation of 4% exists between units the maximum unbalance in load would be only $(1.04)^2 = 1.08$, or 8% variation.

This speed-load relationship will not hold for pumps connected in parallel. Minor variations in speed will produce large changes in unit flow and consequently in engine load. In a three-unit combination, if one engine speed is 2% low and the other two are 2% high the load unbalance would be over 25%. After some consideration it was determined that the control of unit flow appeared to be the best means of equalizing load between the units. This, of course, assumed that the pumps were identical and would be maintained in reasonably good condition.



**AUTOMATIC CONTROL PANEL** has these gages: upper left, station master controller; upper right, flow recorder; center, four governor control units with automatic-manual subpanels above; bottom center, air transfer switch for selecting station suction or station flow for control. Fig. 2.

### Parallel Stations

The three parallel stations each have four 2,000-hp. supercharged diesel engines driving five-stage, 8 by 10 by 12½-in. centrifugal pumps through 7.6:1 ratio speed increasers. Two of the stations use natural gas for fuel, with diesel-fuel pilot oil, and the third burns crude fuel. Pneumatic transmitters are used to indicate station suction pressure, discharge pressure, and flow. Unit flow meters, also with pneumatic transmitters, are placed in the 10-in. discharge line from each pump. The metering run is short and a 30-in. bundle of straightening vanes precedes each orifice meter. A 2-in. bypass line connects each pump discharge to a common header returning to the station suction piping.

The automatic-control panel for the parallel stations is illustrated in Figs. 2 and 3. The station master controller senses on either station flow or station suction pressure (the desired control function is selected manually) with discharge pressure as an overriding control. The master-controller output signal is modified by the unit load-balancing controller.

These controllers are connected through individual governor control units, and automatic-manual panels, to the engine governors. The engine governors have a pneumatically loaded diaphragm and a spring calibrated so that 3 psi. on the diaphragm corresponds to idling speed, while 15 psi. corresponds to full engine speed. When on automatic control, each engine governor is connected directly to the output pressure of the unit load-balancing controller.

### Load-Balancing Controllers

The load-balancing controllers are responsible for maintaining an equal flow in each unit. This insures an even distribution of the pumping load between the engines operating. These controllers are of the proportional-with-reset type. They require no panel space and are mounted behind the control panel.

The principle of this controller is based on a force balance system with four bellows. The output of the master controller is fed into one bellows and acts as the set point for the controller. Opposing it is the measurement bellows, under pressure from the unit flowmeter pressure transmitter. The other two opposing bellows are the proportional and reset bellows.

Each of the bellows exerts a force on a force-balancing detector. This detector also acts as the flapper of a conventional flapper-nozzle assembly. The net effect of all forces acting simultaneously established the position of the force-balancing detector,

its nearness to the nozzle and consequently, the output pressure of the relay.

In operation, any change in pressure in the set bellows (caused by the master controller) or in the measurement bellows (unit flow) moves the force-balancing detector, causing a change in nozzle back-pressure. This operates a relay to increase or decrease output pressure to the engine governor. This output pressure acting on the proportional bellows, changes enough to reestablish a balance of forces on the detector. The amount of output pressure is, therefore, proportional to unit flow or controller output change.

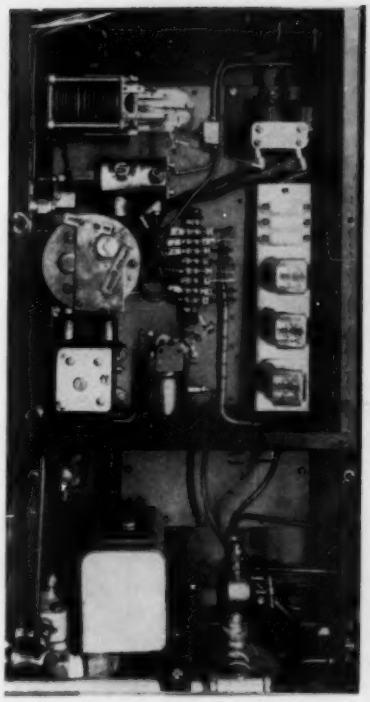
If there is a prolonged differential between the set point and measurement, a sustained difference between proportional and reset bellows will result. Air will flow through a resistance from one to the other, causing the detector to repeat the relay operation and change the output pressure continuously until balance is again restored. This is the reset control action.

This controller is actuated either by changes in the master station controller output or by a variation in unit flow. The engines will respond uniformly to any change in the pumping rate demanded by line conditions. They will also respond individually to any variations in unit flow which may occur due to slight deviations in engine speed within the governor speed-setting capabilities.

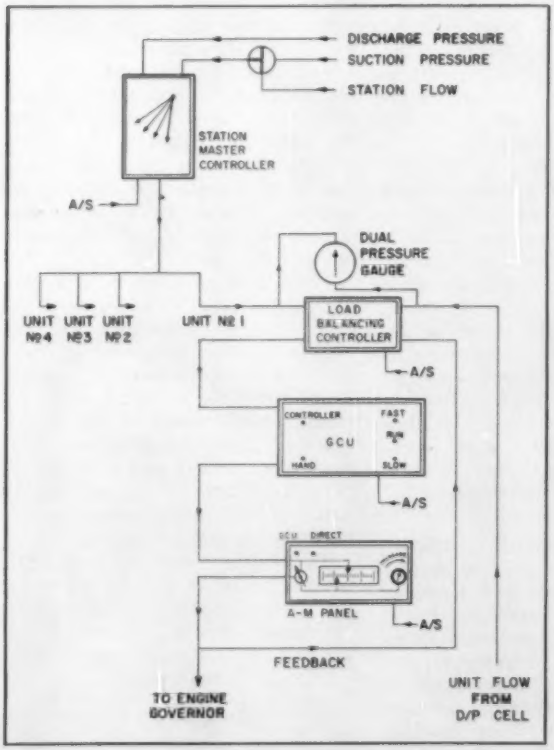
### Governor Control Units

The governor control units (GCU) are instruments specifically designed to extend the automatic operation of the station to putting units on and off stream, and to permit "bumpless" interchanging of units. They have no part in the automatic load-balancing, and are automatically switched out of the pneumatic control circuit as soon as the unit coming on stream is in balance with the other units. These control units are patterned after a similar control used by the Mid-Valley Pipe Line Co.[1] but are modified to Trans Mountain specifications. The unit is shown in Figs. 4 and 5.

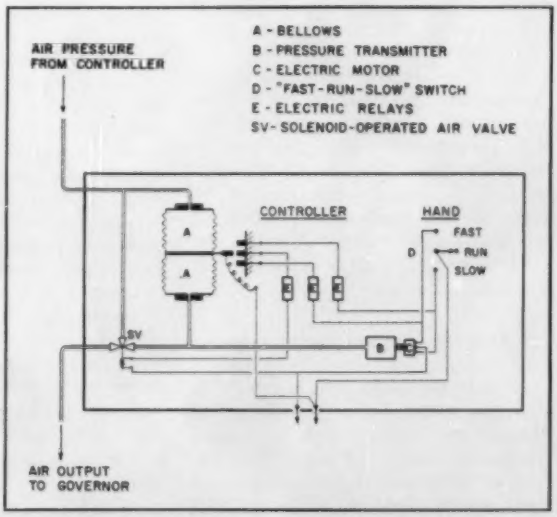
On the front of the governor control unit are two switches. One is marked "Controller-Hand;" the other is marked "Fast-Run-Slow." When in the "Hand" position, the output air to the governor is controlled by the "Fast-Run-Slow" switch. This switch controls a reversible electric motor which in turn drives a pneumatic pressure transmitter. The pressure



**BACK VIEW** of governor control unit. Pressure bellows, lower left; pneumatic pressure transmitter, lower right; switches, relays and neon lights for testing contact action, top. Fig. 4.




**SCHEMATIC** of governor control unit shown in Fig. 4. To the right of the governor control unit is the load-balancing controller. Fig. 5.




**SCHEMATIC** of automatic control panel. Fig. 3.

transmitter can be driven upscale or downscale to adjust output between 3 to 15 psi.

The rate of change of the output from the pressure transmitter is fixed by the constant-speed motor. The speed of this motor was specifically selected to produce a change in governor air pressure that would be slower than the natural rate of acceleration or deceleration of the diesel engine. In the "Fast" position, the output air to the governor increases; in the "Slow" position, it decreases; in the "Run" position, the motor is stopped and the output pressure remains constant.

Inside the governor-control unit, there are two opposing pneumatic bellows. One is connected to the controller output; the other is connected to the pressure transmitter. With the switch in "Controller" position, the motor driving the pressure transmitter is controlled through electrical contacts actuated by the movement of the bellows.

When the pressure transmitter output is less than the controller output, the motor drives the pressure transmitter upscale. When the controller output is the lesser of the two, the reverse action takes place. When the bellows are in balance, the motor is stopped.

Contacts controlled by the bellows movement also control the action of a solenoid-operated air valve. This air valve directs the flow of air to the engine governor, either from the GCU pressure transmitter or directly from the controller. With the switch in "Hand" position, the air valve will always direct the air from the pressure transmitter to the governor.

When the switch is moved to the "Controller" position, if the bellows are out of balance, electrical contacts will immediately cause the electric motor to drive the pressure transmitter towards the balanced position. As soon as the balanced position is reached, the air valve will switch the controller output air directly to the governor.

### Switching On and Off Stream

If two engines are running, and a third is to be put on stream the GCU switches of the third unit are set at "Hand" and "Run," with a pressure transmitter output of 3 psi. The engine is rolled and run at idling speed until it is sufficiently warm to take over a share of the load. The GCU changeover switch is then moved from "Hand" to "Controller."

An unbalance exists in the bellows as the lower bellows will be at the engine governor pressure of 3 psi., while the upper bellows will be under the load-balancing controller output pressure. The pressure transmitter output immediately starts to increase, raising the diesel-engine speed. At some intermediate speed, the pump head will be sufficient to open the unit check valve.

As the increasing unit flow begins to make an impression on the total station output, the station master controller will automatically slow the other two units down to maintain steady line conditions. When the flow is equalized among the three units, the pressures in the bellows will be in balance. The solenoid valve in the third GCU will switch control of the engine governor directly to the load-balancing controller.

While the unit is under the control of the load-balancing controller (which receives its set point from the station master controller) the pressure transmitter will continue to operate to maintain a balanced pressure in the bellows. This permits moving the changeover switch to "Hand" at any time without upsetting the engine speed.

In taking a unit off stream, it is necessary only to move the switches from "Controller" to "Hand," and from "Run" to "Slow." The solenoid valve in the GCU will switch the source of governor air back to the pressure transmitter and the unit will decrease in speed gradually until it comes to the idle position. As the engine speed drops a point will be reached where the unit check valve closes. The master controller will automatically bring the speed of the remaining units up to absorb the redistributed pumping load.

Taking off or adding units to the line by use of the governor-control unit, insures that the changes are made gradually and automatically without the constant attention of the station operator. In parallel operation it is most important that an oncoming unit pass through the transition period where the unit check valve is opening, at a carefully controlled rate of acceleration. If this is done too rapidly, there will be a "bump" in flow and discharge pressure which could cause the station high-flow or high-discharge-pressure automatic shutdown devices to actuate.

The automatic-manual subpanels, shown above the governor-control units in Fig. 2, are not used in normal operation of the automatic-control panel. They are connected to an independent instrument-air supply, and provide the means to control the engines manually from the control room in an emergency or when the automatic-control panel is out of service.

A 2-in. bypass is connected to each pump discharge to provide a cooling flow of oil through the pump when the unit check valve is closed. These, too, are automatically controlled. An air-to-close, pneumatically operated diaphragm valve is installed in each unit bypass.

The diaphragm of the valve is pressured by the output of the unit flowmeter transmitter. When the check valve of a unit coming on stream opens, and enough flow is established to transmit a 5-psi. air signal, the bypass valve closes. Similarly when the unit flow signal drops to 5 psi. or less, the bypass valve will open.

### Dual-Fuel Operation

A further refinement in the dual-fuel stations is the use of the unit flow signal to actuate an automatic gas-to-oil fuel changeover. In dual-fuel operation it is desirable to start the engine on oil and switch to gas following the warmup period. This is done manually. It is also desirable to switch to straight oil operation before shutting a unit down, in order to purge the cylinders and manifolds of gas.

In Trans Mountain parallel-unit stations this is accomplished automatically. The output pressure from the unit flow transmitter is connected to a pressure switch. When the flow signal pressure drops to 4 psi. or less, the switch energizes a solenoid valve located in the gas-supply line which shuts off the gas supply and vents the pressure to atmosphere.

This simulates a condition of low gas pressure to the engine and a changeover valve automatically trips the engine from dual-fuel to oil operation. This has the added safety feature of insuring that dual-fuel engines are switched to oil before shutting down, whether the shutdown is intentional or not.

Trans Mountain has been operating parallel-unit diesel stations for over 4 years. Experience with the original control equipment indicated that while satisfactory, it required modifications to be fitted to the hydraulic characteristics of the pipeline system. These modifications were worked out over a period of time by personnel from the engineering department, the master mechanic, and the technical maintenance staff.

The control system outlined above has proved to be a good system for the control of diesel-driven centrifugal pumps. It is not too complicated, and it is easy to operate and maintain.

### Reference

1. Lester, C. B., "Controls for Pipeline Engines," The Oil and Gas Journal, Oct. 13, 1952, p. 212.

A large diameter steel head takes form on one of Claymont's spinning machines—units that turn out heads up to 19 feet in diameter, in ferrous and non-ferrous metals. Integrated facilities make Claymont a reliable source of quality steel plate and plate products for industry

*by d'Arazien*

# CLAYMONT SPUN HEADS

CF&I

**CHECK CLAYMONT FOR**—Alloy Steel Plates • Carbon Steel Plates • Stainless-Clad Steel Plates High Strength Low Alloy Steel Plates • CF&I Lectro-Clad Nickel Plated Steel Plates • Pressed and Spun Steel Heads • Manhole Fittings and Covers • Fabricated Steel Products Large Diameter Welded Steel Pipe

**PRODUCTS OF WICKWIRE SPENCER STEEL DIVISION • THE COLORADO FUEL AND IRON CORPORATION**

Plant at Claymont, Delaware • Sales Offices in all Key Cities

5745

# NEW MOTOROLA T-POWER 2-WAY RADIO

- Transistorized Power Supply for both receiver and 25-watt transmitter

**Long Life Transistors Replace the Vibrator . . .**
**Reduce Maintenance and "Down-Time"**

Already famous for the lowest maintenance and operating costs in the 2-way mobile radio field, Motorola mobile radio is an even better investment now—with the T-POWER unit. The vibrator is gone! . . . replaced by rugged long-life transistors. Gone, too, is the problem of frequent vibrator replacement. Here is a mobile radio with an all-electronic power supply.

**New Mounting Flexibility with Plug-In Control Head**
**. . . Same Basic Unit can be Used for Front or Trunk Mounting**

With the T-POWER radio, you are no longer restricted to one type of mounting. Install the complete radio, with drawer unit and plug-in control head, for under-dash mounting. For rear mounting the same basic drawer unit can be installed in the trunk and connected by cable to a dash-mounted control head. And—the same basic drawer unit can be interchanged with the equivalent Motorola Twin-V trunk mount radio models operated from a 12-volt negative ground source.

T-POWER radio is another example of Motorola's continuing leadership in the practical application of transistors in mobile radio. Other tested and proved transistorized products include the Dynamic Microphone and Power Voice Speaker.

*Get all the facts.—Write now for literature with complete information.*

MOTOROLA Communications & Electronics, Inc. · 4501 Augusta Blvd., Chicago 51, Illinois · A Subsidiary of Motorola Inc.

## Here, in detail, is shown

# How a computer is applied to a specific problem of pipeline design

BY R. W. LEACH
Pipeline Engineer

AND W. P. REDMOND
Coordinator of Research
Creole Petroleum Corp.

THE CALCULATIONS to determine the most economical number of pump stations and most economical pipe diameter and thickness for an unheated pipeline without injection points are frequently laborious even if all major design conditions have been established.

If some design factors such as throughput, viscosity, length of line, or cost of steel are not established and it is desired to calculate the investment and annual operating costs for a number of combinations of these design factors, these calculations are not only laborious but quite time consuming.

An example of this type of design problem, which admittedly is probably extreme, involved a pipeline for which the estimates for required capacity varied from 25,000 to 90,000 bbl. daily, for crude-oil viscosity from 20,000 S.s.U. to 50,000 S.s.U., for crude-oil gravity from 12° to 14° API, for length of line from 82 to 93 miles, and for cost of pipe per ton from $200 to $300. Since drilling of the oil field in question had only begun, it was quite natural that considerable uncertainty existed as evidenced by the ranges of the above estimates, concerning the design conditions for the pipeline.

Nevertheless, a decision had to be made concerning the pipe diameter and thickness, length of line, pipe specifications, and number of pumping stations, so that the pipe could be ordered and detailed design of the pump stations begun. Making the large number of hydraulic and cost calculations required to provide the basis for such decisions on a desk calculator is so time consuming that the need for using faster and easier methods has become apparent.

### IBM 650 Program

This paper is a description of a program for the IBM 650 computer to make a computation of a pipeline problem, such as the one described above, to give the following for each set of conditions:

1. The internal pressure of the pipe at 1,000-ft. intervals.
2. Number of feet of pipe required for each pipe-wall-thickness.
3. Tonnage of pipe required for each pipe-wall-thickness.

**TABLE 1—INPUT DATA FOR PROGRAM**

| Card | |
|---|---|
| 1 | Rate of flow in thousands of barrels per day, Q.<br>Viscosity of liquid in centistokes, C.S.<br>API gravity of liquid, API.<br>Pressure conversion factor, psi. per ft. of liquid, G.<br>Pipe size, o.d. in inches, D. |
| 2 | Length of line in thousands of feet, L.<br>Number of pumping stations (maximum is 10), n.<br>Elevation of initial pump station in feet, $E_o$.<br>Elevation of end of pipeline in feet, $E_f$.<br>Terminal delivery pressure, psi., $P_d$. |
| 3 | Suction pressure required, psi., $P_o$.<br>Pump efficiency expressed as decimal.<br>Yield stress of pipe material, psi., S.<br>Safety factor for pipe material, S.F.<br>pipe-wall tolerance factor, T (usually 0.875 or 0.900). |
| 4 | Pipe-wall thickness (thinnest acceptable), in., $t_1$<br>Pipe-wall thickness (next heavier thickness), in., $t_2$<br>Pipe-wall thickness (next heavier thickness), in., $t_3$<br>Pipe-wall thickness (next heavier thickness), in., $t_4$<br>Pipe-wall thickness (heaviest acceptable), in., $t_5$ |
| 5 | Cost of line in place excluding pipe cost, $ per foot.<br>Pipe cost, thousands of dollars per short ton.<br>Pump station cost, thousands of dollars per operating horsepower, investment cost.<br>Average number of employes per pump station.<br>Cost of power or fuel, thousands of dollars per horsepower-year. |
| 6 | Pump-station maintenance and supplies, thousands of dollars per horsepower-year.<br>Line maintenance cost, dollars per foot per year.<br>Depreciation plus return on investment, decimal.<br>Unit labor cost, thousands of dollars per year per employe.<br>Blank—punch all zeros. |

4. Discharge pressure at each pump station.

5. Horsepower required at each pump station.

6. Spacing of pump stations.

7. Total cost of pipe.

8. Total cost of pump stations.

9. Total cost of pipeline including pump stations.

10. Total annual charges including operating cost, depreciation, and return on investment.

Since the computer can compute the above results in roughly 10 minutes for an average problem, many combinations of conditions can be analyzed in a few hours of machine time. For any set of design conditions the program may be run a number of times for different combinations of line diameter and pump stations to select the most economical line, which will be the one having the lowest total annual charges. The program may then be run to select the most economical line for other sets of design conditions to show the effect on line size, total investment, and total annual charges resulting from variations made in design conditions.

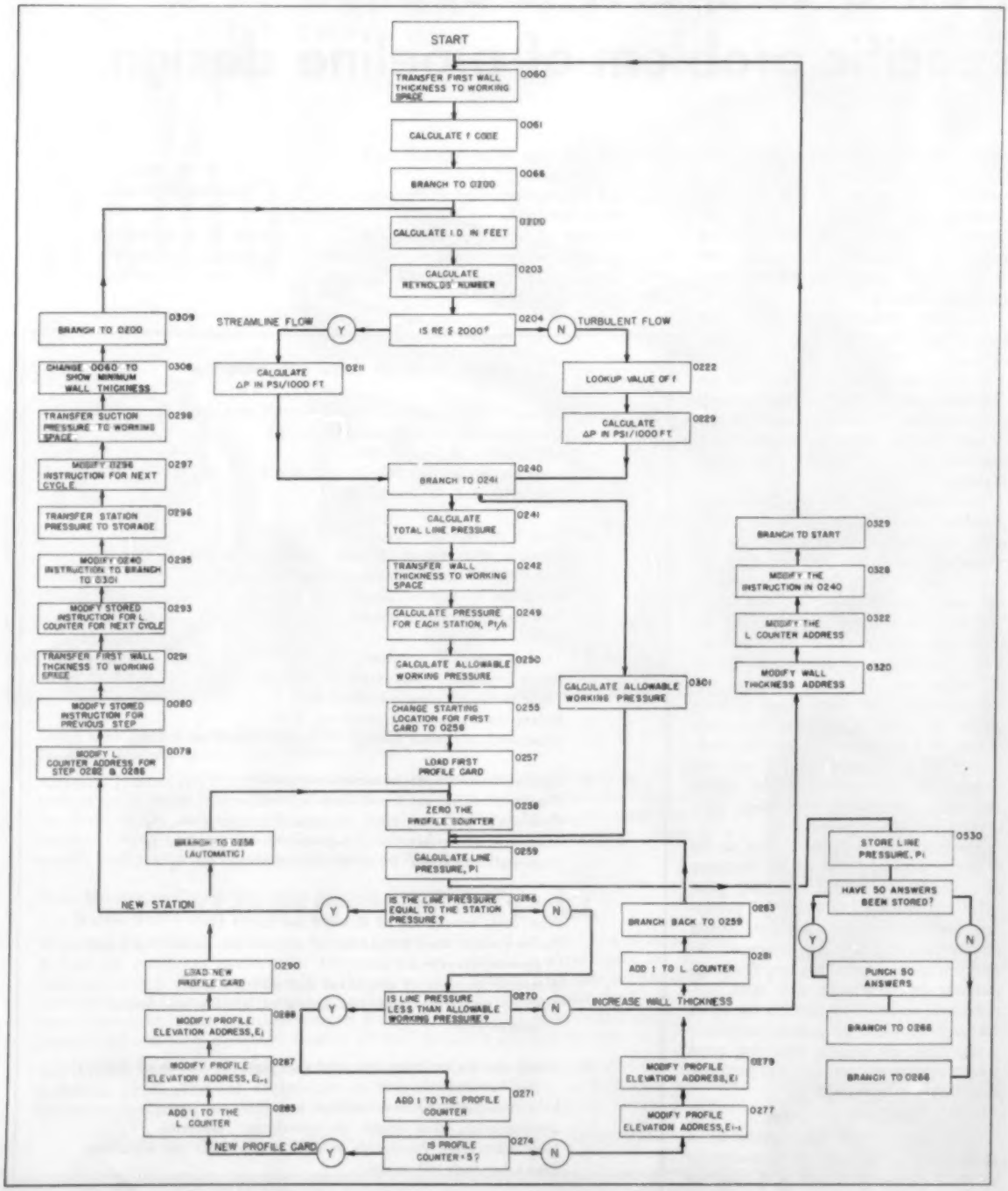



**DIAGRAM** of major program operations for line hydraulic calculations. Fig. 1.

# Regarding pipeline bridges . . .

## *consider this experience record*

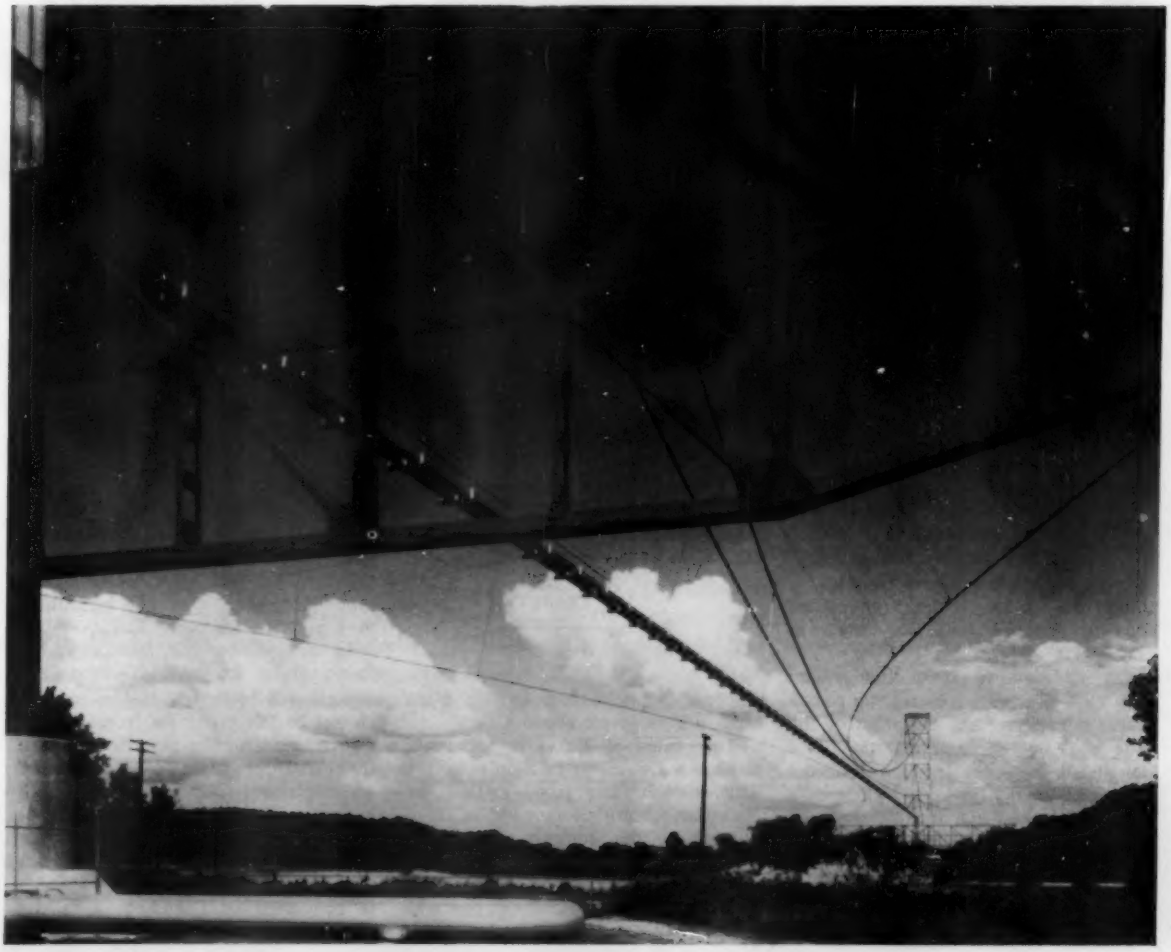
**62 bridges**

**33 rivers**

**11 companies**

MATTHEWS & KENAN, *Consulting Engineers*
19th FLOOR TRANSIT TOWER
SAN ANTONIO 5, TEXAS

**MISSISSIPPI RIVER • 2150′ SPAN • 2–30″ PIPE LINES**



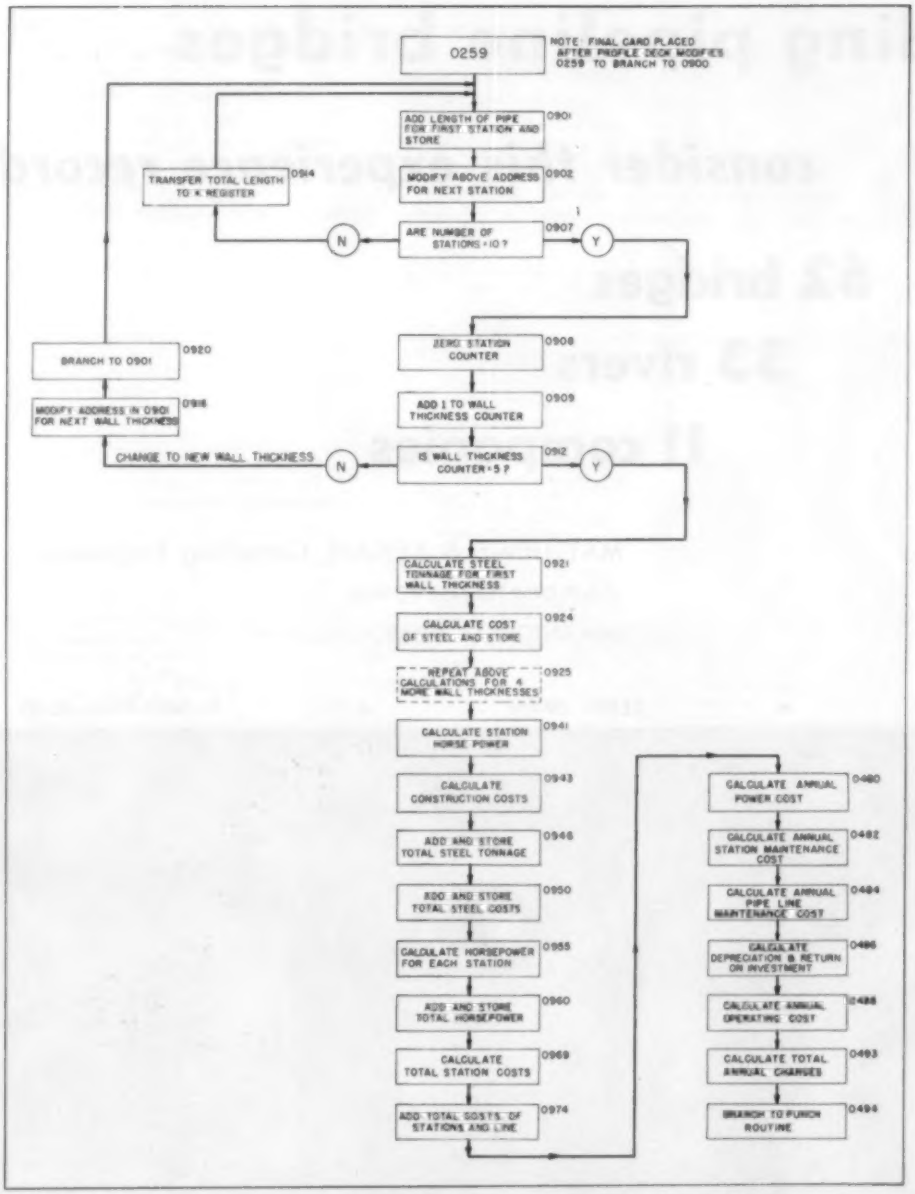



**DIAGRAM** of major program operations for finding construction and operating costs. Fig. 2.

### Punch-Card Data

The input data for the program, which is written in the Humble Interpretive Routine N° 2, are placed on six punched cards as shown in Table 1.

In addition to these input data cards, it is also necessary to punch cards which give the elevation of the line at 1,000-ft. intervals along the length of the line. In the event the line is essentially horizontal, these profile cards may be made identical.

The sequence of major program operations is shown in the block diagram, Figs. 1 and 2, and a reproduction of an answer sheet printed by the computer is shown in Table 2.

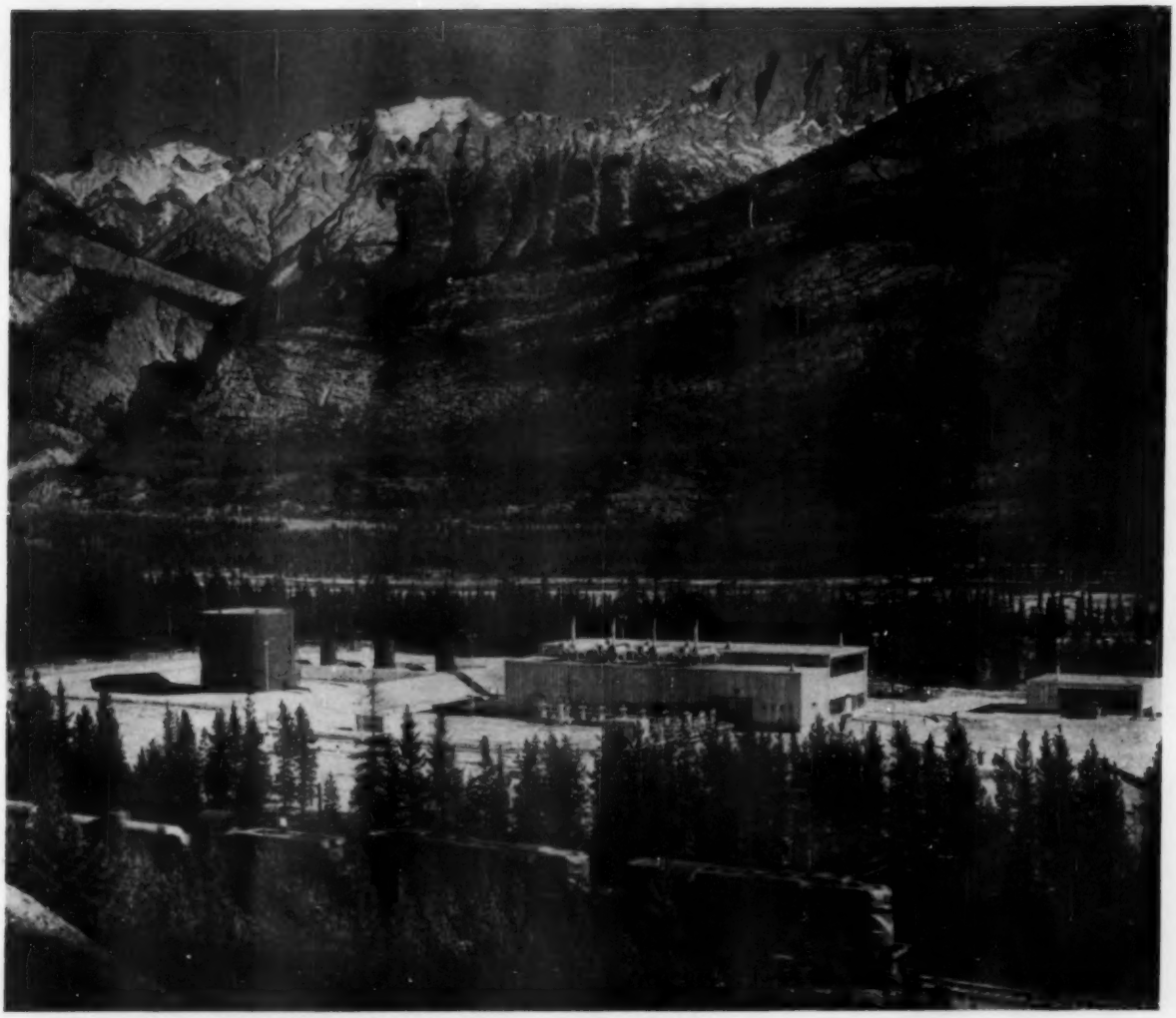
The computer calculates the Reynolds number from the equation:

$$Re = \frac{7.6896\,Q}{d \times C.S.}$$

where d is i.d. in feet and the other units are as given above.

This value of Re is in turn used to obtain a value of friction factor, f. This friction factor used in the flow equation for turbulent flow is interpolated by the computer from five sets of correlations of log Reynolds number vs. log f placed on the computer drum when loading the program, each set being for a different range of pipe size. Since the variations in friction factor and Reynolds number, Re, are very large it was found necessary to use the logarithms of f and Re for table lookup.

In determining the friction factor for a given Re and pipe size, the computer selects five values of Re closest to the given Re from the log f correlation for the pipe size in question. With these five values of log Re and their corresponding values of log f the computer generates a fourth-order polynominal equation in log Re and log f to fit these points. From this equation is calculated log f which is converted to f and used in the following flow equation:



*The towering peaks of Jasper National Park form a spectacular backdrop for Jasper—one of six new Trans Mountain pump stations.*

## *Main Line Over The Canadian Rockies*

The original project and subsequent expansions were completed under Canadian Bechtel management of engineering and construction.

Last year, Trans Mountain Oil Pipe Line Company completed a major expansion which increased capacity 25 per cent–from 200,000 to 250,000 barrels per day.

*Boosting oil over the Canadian Rockies—once the exclusive job of railroad tank cars and giant locomotives—now is a task for Trans Mountain's 24-inch pipeline system and the powerful Jasper Pump Station.*

The 700-mile system began operation in the fall of 1953. Transporting Alberta oil to refineries near Vancouver and on the United States Pacific Coast, the pipeline crosses two towering mountain ranges through difficult and ruggedly-beautiful country.

BECHTEL CORPORATION

Engineers and Builders for Industry

SAN FRANCISCO • Los Angeles • New York • Houston

CANADIAN BECHTEL LTD. • Toronto • Vancouver

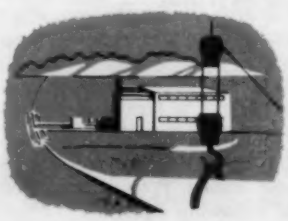


**TABLE 2—ECONOMIC STUDY**

| | | | | | |
|---|---|---|---|---|---|
| Design specifications: | | | | | |
| Flow rate, M. bbl. daily | 45.00000 | | | | |
| Gravity, °API | 12.50000 | | | | |
| Viscosity, cs. | 7040.00000 | | | | |
| Line size, in. o.d. | 30.00000 | | | | |
| Terminal static pressure, psi. | 20.00000 | | | | |
| Number of stations | 2.00000 | | | | |
| Station suction pressure, psi. | 30.00000 | | | | |
| Pump efficiency | .70000 | | | | |
| Material requirements: | | | | | |
| Yield stress, psi. | 52000.00000 | | | | |
| Wall thickness, in. | ¼ | ⅜ | ⅜ | ⅜ | ½ |
| Terminal to Station 1, M feet required | 149.00000 | 37.00000 | 36.00000 | 14.00000 | |
| Station 1 to Station 2, M feet required | 145.00000 | 37.00000 | 36.00000 | 21.00000 | |
| Station 2 to Station 3, M feet required | | | | | |
| Station 3 to Station 4, M feet required | | | | | |
| Station 4 to Station 5, M feet required | | | | | |
| Station 5 to Station 6, M feet required | | | | | |
| Station 6 to Station 7, M feet required | | | | | |
| Station 7 to Station 8, M feet required | | | | | |
| Station 8 to Station 9, M feet required | | | | | |
| Station 9 to Station 10, M feet required | | | | | |
| Total length, M. feet | 294.00000 | 74.00000 | 72.00000 | 35.00000 | |
| Tons of pipe | 11620.35000 | 3656.06250 | 4268.70000 | 2420.90625 | |
| Total tons of pipe | 21966.01875 | | | | |
| Pump station data: | | Station disch. press. | Station hp. | | |
| Station 1 | | 810.13895 | 885.36845 | | |
| Station 2 | | 831.96479 | 909.22104 | | |
| Station 3 | | | | | |
| Station 4 | | | | | |
| Station 5 | | | | | |
| Station 6 | | | | | |
| Station 7 | | | | | |
| Station 8 | | | | | |
| Station 9 | | | | | |
| Costs: | | | | | |
| Steel, M. dollars per ton | .22500 | | | | |
| Pipe costs, M. dollars | 4942.35422 | | | | |
| Pipe installation costs, M. dollars | 1900.00000 | | | | |
| Pump station, M. dollars per installed hp. | .50000 | | | | |
| Total cost of pump stations, M. dollars | 897.29475 | | | | |
| Total cost of pipeline, M. dollars | 7739.64897 | | | | |
| Operating costs: | | | | | |
| Power, M. dollars per hp.-year | .13800 | | | | |
| Maintenance supplies, M. dollars per hp-year | .02000 | | | | |
| Line maintenance, dollars per foot | .10000 | | | | |
| Depreciation and interest | .18000 | | | | |
| Cost per employe, M. dollars per year | 8.00000 | | | | |
| Number employes per station | 12.00000 | | | | |
| Total cost of power, M. dollars per year | 247.65335 | | | | |
| Total maintenance, M. dollars per year | 35.89179 | | | | |
| Total line maintenance, M. dollars per year | 47.50000 | | | | |
| Depreciation and interest, M. dollars per year | 1393.13681 | | | | |
| Labor cost, M. dollars per year | 192.00000 | | | | |
| Total annual cost, M. dollars per year | 1916.18195 | | | | |

$$\frac{PSI}{MI} = \frac{3.444 \times 10^{-5} \times f \times Q^2}{d^5 (131.5 + API)}$$

$$\frac{P_t}{n} = \frac{(PSI/1{,}000\ ft.) \times L + (E_t - E_o)\, G - n\, P_o}{n}$$

If the Re is less than 2,000, the flow is streamline and the following flow equation is used:

$$\frac{PSI}{MI} = \frac{28.688 \times 10^{-5} \times C.S. \times Q}{d^4 (131.5 + API)}$$

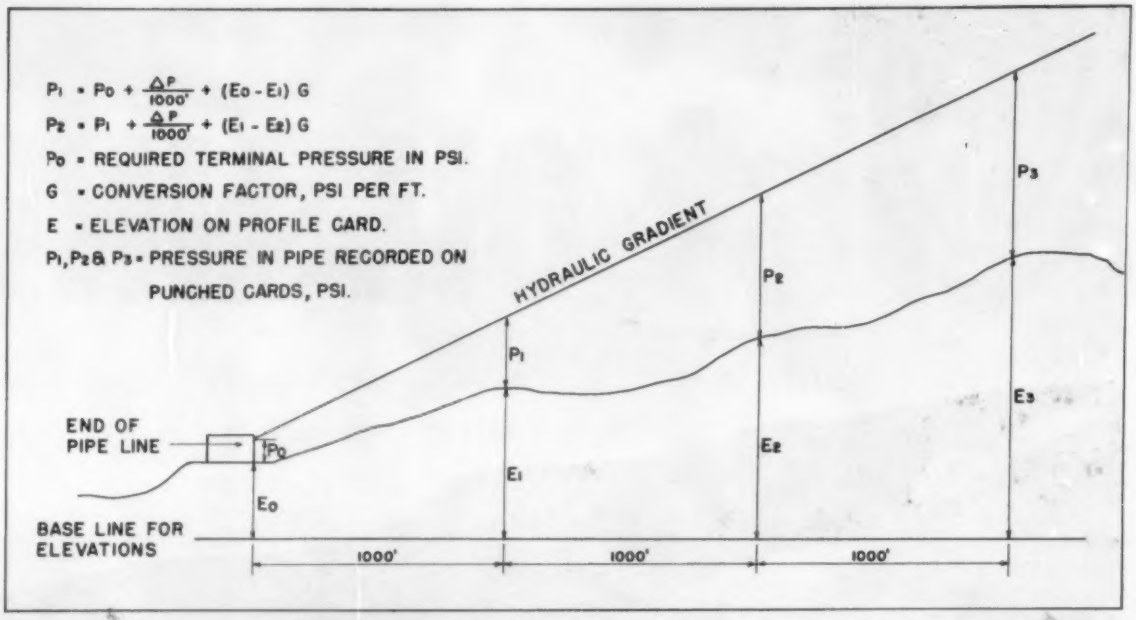
After obtaining the pressure drop per 1,000 ft. the pressure required at each pump station, $P_t/n$, is computed from the following equation:

The program then calculates the maximum allowable working pressure for the initial section of pipe using the following equation:

$$W.P. = \frac{2 \times t \times S \times T}{D \times SF}$$

**Line Hydraulic Calculations**

The line hydraulic calculations are begun at the end of the pipeline, instead of the beginning as would be done if a computer were not used, and the pressure is calculated at each 1,000-ft. interval as shown on Fig. 3. At each of these intervals the internal pressure is compared with the station pressure and maximum allowable line pressure which were previously calculated to determine whether or not a new pump station or a new heavier pipe-wall thickness is required at that point.




**PRESSURE PROFILE** along pipeline at 1,000-ft. intervals. Fig. 3.

For example, at a point 100,000 ft. from the end of the pipeline the pressure would be the terminal delivery pressure required (input data) plus the computed pressure drop per 1,000 ft. multiplied by 100, plus or minus the elevation difference expressed in psi. After this pressure is computed it is compared with the pump-station pressure $P_t/n$, computed above.

If the line pressure has risen to the pump-station pressure a new station is required at that point and this fact will be shown in the final answer sheet. Let us assume, however, that the pressure in the pipeline at a point 100,000 ft. from the end of the line is still below the pump-station pressure. In this event, no pump station is required at this point and the computer will proceed to compare the line pressure with the maximum allowable working pressure of the pipe previously calculated.

If, for example, the wall thickness of the pipe had been $\frac{7}{16}$ in. for the previous 100,000 ft. and the internal pressure had risen with each 1,000-ft. interval until now it was equal to the maximum allowable working pressure of $\frac{7}{16}$-in. wall pipe, the wall thickness of the pipe would be changed from $\frac{7}{16}$ to $\frac{3}{8}$-in. The point at which the wall thickness changes is stored by the machine and appears on the final answer sheet.

Since this increase in wall thickness decreases the inside diameter of the pipe, the computer recalculates the pressure drop per 1,000 ft. for the new thickness. In addition, at this point a new maximum allowable working pressure corresponding to the new wall thickness is computed. The computation of the internal pressure every 1,000 ft. then continues.

Let us now assume that at a point 140,000 ft. from the end of the line the pressure has risen to a value which is still less than the allowable pressure of $\frac{3}{8}$-in. wall pipe but is equal to the pump-station pressure. This indicates that a new pump station is required. At this time the computer changes the wall thickness from $\frac{3}{8}$-in. back to the minimum wall thickness; transfers the internal pressure of the pipe, which is now station discharge pressure, to storage; and transfers station suction pressure (input data) to the pressure working space in the computer.

The computer is now ready to continue in a similar manner to make the hydraulic calculations for the section of pipeline leading to the next pump station. This process will continue until the end of the pipeline, which for this program will be the initial pump station, since calculations are started at the discharge end of the line.

With this design procedure a pipeline may have pipe with up to five different wall thicknesses, the heaviest sections naturally being next to the discharge side of the pump stations where the pressure is greatest. By reducing the thickness of the pipe as the pressure decreases a considerable saving in steel tonnage is realized.

**Utilizing Drum Space**

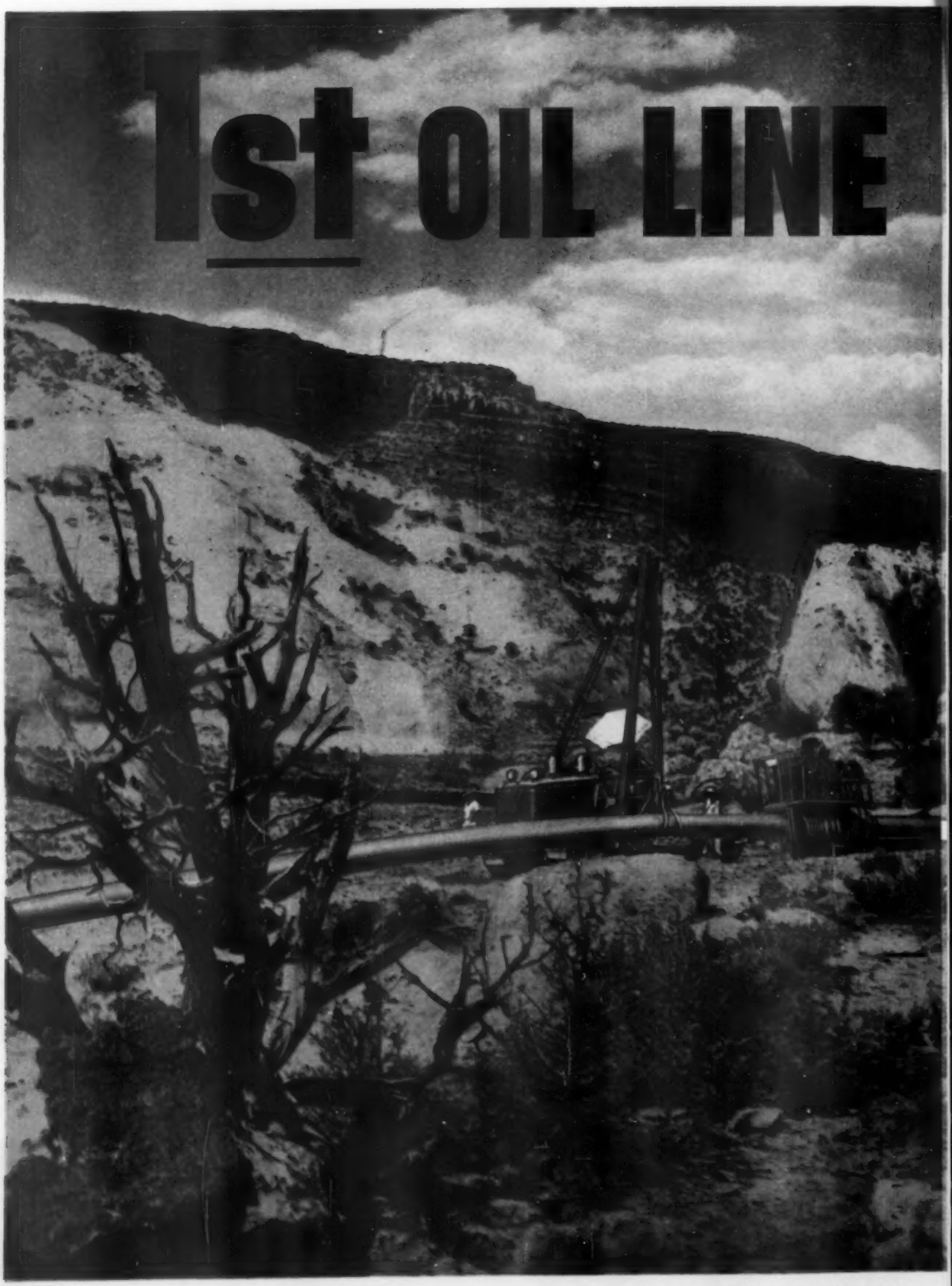
Elevations required during the calculations are read automatically by the computer from profile cards and placed in five elevation locations on the computer drum. When the last of the five elevation values from a profile card is used, another profile card is read and the previous elevation values are replaced with those for the next 5,000 ft. of line.

The program uses profile cards which are read to the magnetic drum as required during the program, instead of considering profile information as input data and placing all of the profile information on the drum initially. The limited amount of drum space available makes this necessary. For example, if elevations for each 1,000 ft. of line were placed on the drum for a 200-mile pipeline, 1,056 of the 1,300 drum locations available for input data and for the program would be occupied.

During the calculations answer cards are punched which give the pressure in the pipeline at each 1,000-ft. interval. These answers, which are punched 50 at a time, give a pressure profile for the entire line. Any negative or zero values in this profile will indicate a low-pressure-control point.

Drum location numbers 0901 to 0975 as shown on the block diagram are used to program the calculations for lengths of pipe for each wall thickness, tonnage of pipe for each wall thickness, total tonnage of pipe, total cost of steel, horsepower required at each station, cost of line construction and miscellaneous materials, cost of pump stations, and total cost of pipeline including pump stations.

Since the horsepower calculated is


1st OIL LINE

# TO CALIFORNIA

## The Four Corners Pipe Line is the first line ever built to supply California refineries with oil from outside the state

**Shell Pipe Line Corporation,** acting as agent for the Four Corners Pipe Line Company, designed, constructed and will operate this important 16-inch line. The line itself will be owned by six companies — Continental Pipe Line Company... Gulf Oil Corporation... Richfield Oil Corporation... Shell Oil Company... Standard Oil Company of California... and Superior Oil Company.

The purpose of the line is to tap reserves of 250 to 500 million bbls. to meet anticipated expansion in California's economy.

**A. O. Smith** furnished more than 600 of the 637 miles of 16-inch main line that runs from Aneth, Utah, to Los Angeles.

**For almost 30 years**... A. O. Smith line pipe has always been manufactured to a high standard of quality... precisely controlled at every step of production. That's why A. O. Smith pipe, made and installed in 1928, is still in operation. That's why so much A. O. Smith pipe is found in every important pipeline project.

From Aneth, Utah, to metropolitan Los Angeles, the line surmounts many obstacles. They include—elevations ranging from sea level to 6700 feet . . . deserts . . . three major river crossings . . . 200 miles of solid rock . . . and daily temperatures fluctuating between 40 and 120° F.

*Through research* A.O. Smith *... a better way*

**A.O.Smith**
CORPORATION
**TUBULAR PRODUCTS DIVISION**
Milwaukee 1, Wisconsin

Chicago 3 • Dallas 35 • Houston 2 • Los Angeles 17 • Tulsa 3
Midland 5, Texas • New Orleans 12 • New York 17
A. O. Smith International S. A., Milwaukee 1, Wisconsin, U. S. A.

the amount of power actually required and does not include standby horsepower, the pump-station cost figure in the input data should be for thousands of dollars per horsepower actually used. Since normally a considerable amount of standby horsepower is installed, the pump-station unit cost based on operating horsepower will be higher than the unit cost based on installed horsepower.

After computing the various costs making up the total investment for the completed pipeline, the program calculates the total annual charge using the following equation:

Total annual charge = annual cost of pump-station operation + annual cost of station and line maintenance + total annual depreciation + total investment × minimum acceptable return on investment.

The punch routine punches answer cards which give not only the calculated results but also pertinent input data. These answer cards, after being merged with a deck of descriptive cards, are printed to give the final answer sheet, Table 2, on which is printed input data in addition to calculated results. The descriptive deck is general in nature and does not have to be modified for individual problems.

It is believed that this program may be used advantageously to select the economic line size for a given pipeline problem, to estimate the cost of pipelines, to determine rapidly the effect on total investment and total annual charge resulting from changing such factors as pipeline throughput, length of line, cost of steel or cost of electric power, and to obtain pipeline hydraulic information.

### Program for Multiple Injection Pipeline

The above program is for a pipeline having at any given moment the same throughput along its entire length. To assist in the design of pipelines having injection points at which various amounts of liquid are continuously added to the main pipeline at various points along its length, a separate program for the IBM 650 computer has been prepared. This program has as its sole objective the computation of the internal pressure of the pipe, taking into account line elevation, at 1,000-ft. intervals along the entire pipeline.

Computations for lines with up to six injection points with any desired spacing or injection rates can be made. The fluid characteristics of each injected stream may differ widely and, since the pressure drop per 1,000 ft. is recalculated after each change in wall thickness, change in pipe diameter or change in the main stream due to an injection, the pressure profile for lines having laminer and turbulent flow simultaneously in different parts of the line can be computed.

In this program pump stations are placed in the line at those points at which the pressure has risen to some fixed pump station discharge pressure specified in advance in the plant data. Therefore the number of pump stations will be determined by the value set for this discharge pressure. Changes in pipe diameter which will all be made at the pump stations, are also predetermined by placing the sequence of sizes, starting from the discharge end of the line, in the input data.

Since computation involving multiple injections are frequently time consuming when using a desk calculator, it is believed that this program may be useful.

### Heated Pipeline Program

The hydraulic calculations for a heated pipeline can be very time consuming since it is necessary to find the temperatures, viscosities, and pressure drop per unit distance at a large


"YARD WORK" done the easy way . . .

H&M pipe beveling machines mean speed and accuracy on ANY size of pipe!

With pipe fabrication becoming increasingly important in the repair and maintenance shops and yards throughout American industry, H&M Pipe Cutting and Beveling Machines offer the easiest, quickest and most efficient solution to preparing pipe for welding, even by untrained operators.

One man can handle and operate any size H&M machine — any of the 7 H&M models handling from 1½" to 36" pipe — after only a few minutes of instruction — and be assured of perfect cuts or bevels every time.

The split-horseshoe gear of H&M machines, plus their extreme lightweight, permits the operator to slip them easily over the next section of pipe and within a matter of minutes the cut or bevel is finished, accurate and true.

Important H&M Accessories for Shop or Field use. . . .

THE OUT-OF-ROUND MOTORIZED UNITS
SHAPE CUTTER BOXES AND DOLLIES
FLEXIBLE SHAFT HOOKS, CLAMPS

H&M TM REG.
PIPE BEVELING MACHINE COMPANY
311 E. Third St. Diamond 3-0241
TULSA, OKLAHOMA

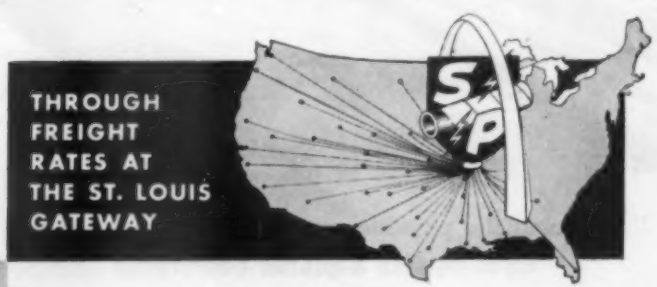
"...pacing the pipeline construction industry
for more than a quarter century"

price tower H·C·PRICE·CO PIPELINE CONSTRUCTORS bartlesville, oklahoma

THE HALLMARK OF QUALITY COATING and WRAPPING!

When your pipe has been coated and wrapped in our plant in accordance with procedures that establish the highest standard of quality for pipe protection, its kraft wrapper displays this hallmark of quality.

Whenever and wherever you see it, you may be assured of the finest pipe protection by Standard Pipeprotection.




S P ®
standard pipeprotection inc.
3000 SOUTH BRENTWOOD BLVD. • ST. LOUIS 17, MISSOURI

number of points and, in general, as the number of points is increased the accuracy of the final result is improved.

In addition, it may be desired to make various sets of calculations varying the pipe diameter, heater spacing, temperature to which the oil is heated, and coefficient of heat transfer between the pipe and its surroundings. In an effort to reduce the amount of work involved in these calculations a computer program has been prepared which calculated the following for the liquid at uniform intervals of length which can be made as short as desired:

1. Temperature.
2. Viscosity.
3. Specific gravity.
4. API gravity.
5. Pressure drop per mile for liquid having above characteristics.

It should be noted that this program is only suitable for pipelines having a reasonably constant ambient temperature and a constant throughput.

This program, which is suitable for lines in which there is simultaneous laminar and turbulent flow, has the following input data which can be varied for case studies:

1. Throughput.
2. Pipe diameter.
3. Pipe-wall thickness.
4. Length of line between heater stations.
5. Interval of length between calculations.
6. Temperature of liquid leaving heater station.
7. Ambient temperature.
8. Heat-transfer coefficient.

Since the number of computations involved in the design of a heated pipeline is particularly large, this program may be of use in reducing the amount of engineering time required to investigate the hydraulics of such pipelines or in permitting more thorough investigations than might otherwise be possible.

## BOOKS

MODERN CHEMICAL PROCESSES, Vol. 5. Published by Reinhold Publishing Corp., 430 Park Avenue, New York 22. 154 pp. $5.

This is the fifth volume in a series that describes American chemical technology in pertinent detail.

Vol. 5 contains 14 recently developed chemical processes, all now in operation.

Descriptions include: background, commercial and technical history and origin of present installation; plant installation, design details of nonstandard items; process and operation of plant; economics of process, including raw materials and processing cost breakdowns; plant investment and amortizations; personnel, and future prospects.

# CROSE . . . MOST COMPLETE LINE OF PIPELINE CONSTRUCTION EQUIPMENT

Crose serves the pipeline construction industry on a world-wide front with the most complete line of equipment outstanding for its ruggedness, efficiency and operating economy. Our many supply points make Crose equipment readily available for your next job — in most any part of the world.

BRANCH OFFICES: *Denver, Colorado, Ph. EMpire 6-0332 • *Houston, Texas, Ph. MIssion 5-2484 • *Elizabeth, N. J., Ph. ELizabeth 4-4244.

IN CANADA: CROSE-CURRAN LTD., *Edmonton, Alberta, Ph. 3-5135 • *Toronto, Ontario, Ph. CH 2-9571, CH 2-9581 • *Ft. William, Ontario, Ph. 2-7793, 2-7794.

EXPORT OFFICE: New York, N. Y., Ph. BRyant 9-2236.

FOREIGN REPRESENTATIVES in Argentina, Bolivia, Colombia, Chile, Australia, Austria, Yugoslavia, Belgium, France, Brazil, Germany, Hawaii, Israel, Italy, Middle East, Turkey, South Africa, Trinidad, Venezuela and Mexico.

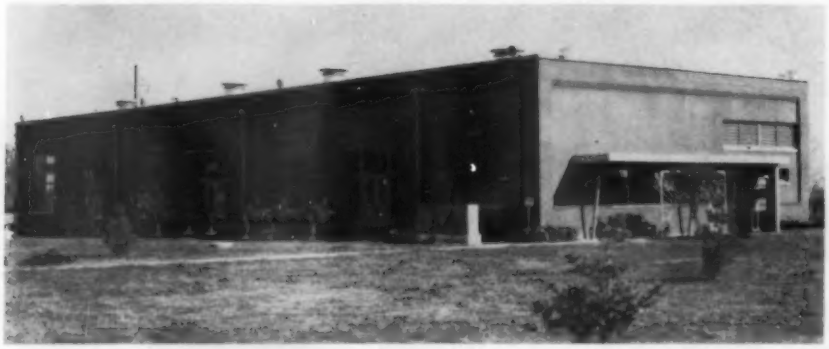
*Warehouses in 6 locations.

**Crose** MANUFACTURING COMPANY, INC.

2715 DAWSON ROAD PHONE MAdison 6-2171 TULSA, OKLAHOMA

# Service Pipe Line looks at Electric PUMP STATIONS

*. . . and at some economics of their operation.*

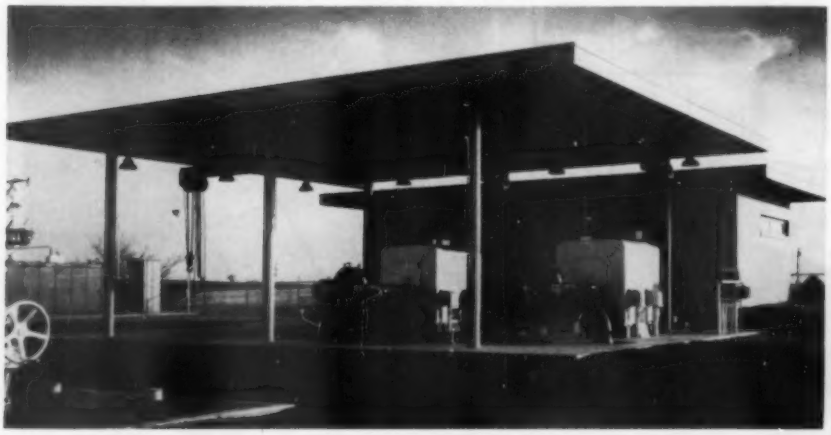


**Completely housed** Electric stations were first designed and built similar to diesel stations, with motors, pumps, controls, and office in a single building. Fig. 1.

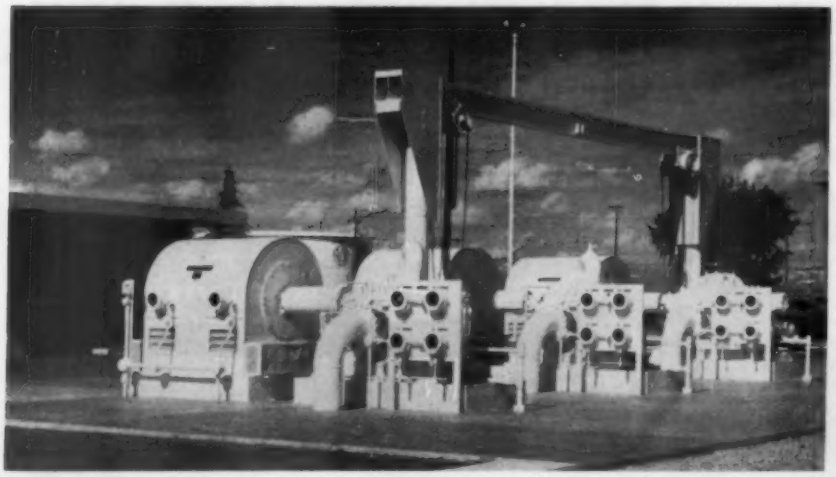
BY J. L. CALLAHAN
Electrical Engineer
Service Pipe Line Co., Tulsa

THE PIPELINE INDUSTRY has always been progressive in the design of pump stations to take advantage of modern practices and techniques that will permit the safest and most economical operations.

The stations we are designing and building today are the complete outdoor type, especially the electric stations. This type makes use of the most modern machinery and equipment, minimizes investment in buildings, provides safer operating conditions,



**Canopy** The transition between the completely housed and the outdoor station had a canopy over the motor and pump, adjacent to office and control building. Fig. 2.



**Outdoor** Removal of the canopy, where its expense and utility were questioned, was the next step in the evolution, creating the cheapest and safest design. Fig. 3.

**Control** Next came the outdoor booster remote controlled via microwave. Fig. 4.

**Modern diesel** This station is smaller than older diesel counterparts, with engines inside the building and pumps outside under a canopy, and a separate control building. Fig. 5.

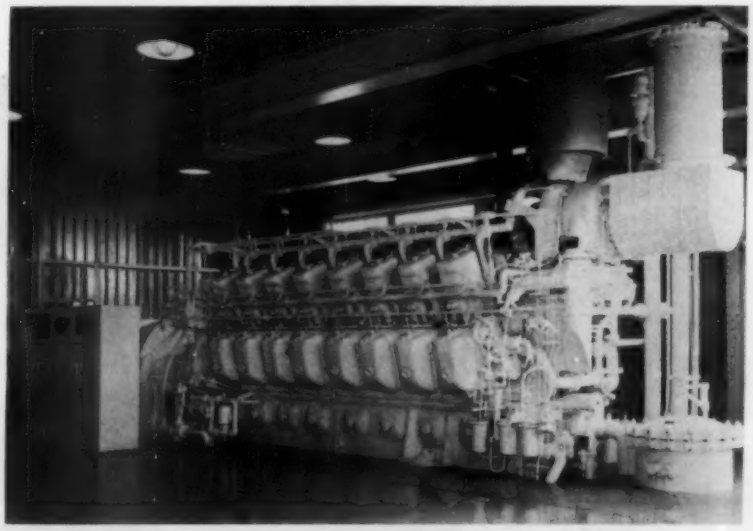
and reduces maintenance costs. So far, the diesel station has not been designed as a complete outdoor station, but the trend is in this direction.

The operation of the modern station has been streamlined by the installation of labor-saving devices, controls, and instrumentation. Many of the stations are either semi or completely automatic permitting the station to be operated with a small crew, or remotely controlled to operate without a crew. Remote control of electric stations is commonplace. A few diesel stations are now remotely controlled and there will be more of these as improvements are made in the controls and experience gained in their operation.

Since World War II pipeline companies have converted many diesel stations to electric. This has been made possible primarily because the electric-utility companies have made vast extensions to their transmission and distribution systems. Generating capacity has been increased tremendously and these companies have interconnected their systems to insure dependable service. These improvements in availability and dependability have been responsible for pipeline companies no longer being reluctant to rely on purchased power.

The cost of purchased power remained fairly stable for several years following the war, but in the past year or two there has been a general increase. It appears that there will be additional increases that may make the use of electric power unattractive, in some cases result in the use of other sources of power.

The modern trend in the design and development of diesel engines has been toward lighter-weight, higher-speed machines. This type engine was first developed for railroad service and in recent years has found application in the pipeline industry. Service Pipe Line has experience with only one



**Engine** This compact, high-speed dual-fuel 2,000-hp. engine has much greater power concentrated in a smaller package than older types. Fig. 6.

**Control** Starting and control are handled from a central control panel, similar to the modern electric unit, and also may be controlled remotely. Fig. 7.

Service Mark Reg. U. S. Pat. Off.

## TUBE-KOTE RESEARCH ASSURES SUPERIOR COATINGS TO STOP CORROSION

When you specify Tube-Kote, you have every right to expect a far superior coating.

Tube-Kote's outstanding success in preventing corrosion is a result of constant and careful attention to many details. Ingredients must be blended within minute tolerances. Preparation of the metal must be carried on under strict supervision and inspection. Application must be made under near perfect conditions, and curing must be precise to meet the harsh requirements of production use.

Only Tube-Kote has a research department to provide laboratory control over every step in the plastic coating process. Tube-Kote research has pioneered the development of new and better coatings for specialized uses.

When you need superior coatings . . .

*think*

*The newly completed Tube-Kote laboratory in Houston is devoted to full-time research to control quality and find even better coatings for the future.*

# TUBE-KOTE®

P. O. BOX 20037 • HOUSTON 25, TEXAS • BRANCH PLANT • HARVEY, LOUISIANA

EXPORT REPRESENTATIVES: LUCEY EXPORT CORP. 223 BROADWAY, NEW YORK 7, N.Y.

*Tube-Kote Research and Superior Methods Bring You More Durable Coatings and Faster Service . . . at Lower Cost*

**THE AUTHOR**

J. L. Callahan, electrical engineer, Service Pipe Line Co., was graduated from the University of Oklahoma in 1932 with a B.S. in electrical engineering. He had varied engineering experience with Shell Oil Co., Oklahoma Gas & Electric Co., and Phillips Petroleum Co., before joining Service in 1946. He has since been engaged in electrical engineering related to design and operation. He was promoted to utilities engineer in 1952 and now negotiates utility contracts and arranges for power facilities. He is a registered professional engineer in Oklahoma.

make of engine that has been modified and revised to adapt it to our requirements. These engines have performed satisfactorily and our faith in their dependability is demonstrated by the fact that they will be used in a completely automatic remotely controlled station to be built this fall.

In the following discussion the electric and diesel stations will be treated separately to highlight some of the developments leading to the modern station. A comparison of the maintenance and operating costs of the modern electric and diesel station has also been included.

### Electric Stations

Like most other industries or businesses, pipeline companies are always seeking better, more efficient ways of doing things. Like others also, there is a reluctance to make radical changes and usually changes are made in an orderly, progressive manner. When we first began to design and build electric stations they were designed similar to the diesel station. The motors, pumps, controls, and office were housed in a single building. Fig. 1 shows such a station.

The motors were installed in a room separated from the pumps by a firewall, and the motor controls were either installed in the motor room or a separate control room that also served as an office. The motors were drip-proof construction with bottom air discharge.

Large air ducts were installed under floor that either discharged the cooling air outside or back into the motor room for heating it. When the motor controls were located in the motor room sufficient ventilating equipment was provided to prevent the concentration of explosive vapors that might be ignited by an arcing contact in the controls.

This type of station has the disadvantage of requiring a large investment in a building that is expensive to maintain. There are also objections to it from the standpoint of safety even though every precaution is taken to combat the hazards. To overcome these disadvantages it would be necessary to eliminate the building, but in order to do this, motors and controls would have to be obtained that could be installed outdoors.

Motor manufacturers had developed weatherproof motors for use in the new outdoor-type power plants. It was determined that we could use this type of motor in our pump stations. Outdoor-type motor controls and switchgear have been available for many years, so there was no problem in obtaining it.

In making the transition from the completely housed station to the outdoor station some stations were built with a canopy over the motor and pump. A control building and office was located adjacent with outdoor-type switchgear located near the substation. At one station electric cable was installed in the concrete slab to heat it during periods of ice and snow. A station of the design described above is shown in Fig. 2.

In some locations where the expense and utility of the canopy was questionable, it has been eliminated. This has resulted in the outdoor station as shown in Fig. 3.

The small building houses the controls and communication equipment and provides a small office and storage space. This type of station is the most economical to build and maintain. There is also a big advantage from the safety standpoint in that explosive vapors cannot collect.

The trend for the past few years has been toward more and more automation for pipeline operations. A large portion of automation has been applied to the control and monitoring of relay stations. Some of these are hydraulically controlled by the operations of pressure switches at the controlled station, and some are remotely controlled by use of wire-line or microwave circuits from a central control point.

The controlled station must be provided with protective devices that will permit it to operate safely without human supervision. Certain of these devices, such as bearing-temperature detectors or vibration protectors, must operate as lockouts in the event of a malfunction. This will prevent the pumping unit from being operated until an inspection has been made to clear the trouble. Fig. 4 shows an outdoor-type relay station that is remotely controlled by the use of a microwave system.

### Diesel Stations

In the older diesel stations slow-speed, heavy engines are used to drive either horizontal or vertical positive-displacement pumps. Very large buildings are needed to house these units which of course means a large investment. The maintenance costs for these stations are very much higher than for the modern station.

Even though the modern diesel station has not been designed as a complete outdoor type it has been greatly reduced in size, permitting appreciable reductions in the investment in building and in maintenance costs. Fig. 5 shows a modern diesel station. Two 2,000-hp. dual-fuel engines are installed inside the small transite-and-steel building. The centrifugal pumps are located outside the building with a canopy over them. A small control building houses the controls, office, warehouse, and workshop.

A view of the new engine is shown in Fig. 6. It is a V-16, 9 by 10½-in., 1,000-r.p.m. dual-fuel engine. Some idea of how this engine compares with an older engine of comparable power is given below:

**COMPARATIVE DATA FOR DIESEL ENGINES**

| | New | Old |
|---|---|---|
| Horsepower | 2,000 | 2,150 |
| Number of cylinders | 16 | 5 |
| Full load speed, r.p.m. | 1,000 | 240 |
| Weight per horsepower, lb. | 21 | 110 |
| Foundation, cu. yd. | 45 | 259 |
| Spacing between units, ft. | 20 | 30 |

This engine is started and controlled from a central control panel shown in Fig. 7. In this respect it is not too unlike the modern electric unit. Its controls may be connected to a microwave or wire-line circuit for control from a distant point.

Because there are auxiliaries associated with engines that are not needed with electric motors, the control system is more complicated. The time to start, warm up, and load the engine is somewhat longer than for an electric-motor-driven unit. Likewise, the shutdown time is a little longer because of the necessity for properly handling the cooling water.

A source of electric power must be provided for the diesel station for the operation of its auxiliaries and control. This source may be either purchased power or provided by auxiliary generating equipment. My company purchases the auxiliary power but provides enough capacity in auxiliary generation to keep the station operating during an emergency.

### Comparative Investments and Operating Costs

The electric station shown in Fig. 3 and the diesel station shown in Fig. 5

**STATION COST BREAKDOWN**

| Station— | Gas and electricity | Fuel oil | Labor | Maintenance | Other | Total |
|---|---|---|---|---|---|---|
| Diesel | 36.7 | 11.5 | 21.9 | 23.5 | 6.4 | 100% |
| Electric | 62.8 | .... | 23.4 | 12.6 | 1.2 | 100% |

were placed in operation on our new Wyoming line in 1956. The facilities at these stations are very similar except that the electric station has three pumping units, one 800-hp. unit and two 1,000-hp. units, and the diesel station has two 2,000-hp. units.

In order to compare investments on an equivalent horsepower basis it is necessary only to add sufficient money for larger motors since the centrifugal pumps are large enough to be used with them. On the basis of 4,000 hp. the investment per installed horsepower for the diesel station is 10.5% higher than for the electric station.

During the latter part of 1956 the conversion of the engines for dual-fuel operation was completed and they were operated as such during all of 1957 except for short periods when gas was not available. Diesel oil is used as the pilot oil. During the year these engines used between 11 and 12% pilot oil, but at times it dropped as low as 8.3%.

These are both batching stations and are operated by the same size crew, a one-man tour. It has been possible to do this because controls and devices were installed to make these semiautomatic stations. If major changes or repairs are needed additional personnel is obtained to perform this work.

Operating and maintenance costs for our large stations are kept on a cost-per-hydraulic-horsepower basis. The hydraulic horsepower developed at a station is the product of the barrels of oil pumped times the average discharge or differential pressure times the factor 0.000408. This basis is used because it is the true measure of the work performed to pump the oil and takes into account machinery efficiencies, auxiliary power costs, labor, maintenance, and all other costs associated with the station's operation.

During 1957 the costs per hydraulic horsepower for the electric station were 15% higher than for the diesel station. The cost per barrel of oil pumped by the electric station was 32% higher than for the diesel station. This larger difference reflects the comparative costs of gas and fuel oil with electric power. The accompanying breakdown shows per cent of total cost per hydraulic horsepower for the diesel and electric stations.

It can be seen from the table that the investments for modern engine and electric stations are comparable, but that it is necessary to purchase power at a very attractive rate in order for the electric motor to compete with the dual-fuel engine from an operational standpoint. Considering that there has been a general increase in the cost of electric power during the past few years, and there is evidence that there will be other increases, the modern engine-type station should find increasing application.

## BOOK

IRA REINEHART'S YEARBOOK, 1958. Two volumes. Published by Rinehart Oil News Co., Box 1208, Dallas 22.

This is the 1958 edtion of the traditional Rinehart summary of discoveries, extensions, and new pays throughout the United States and the Williston basin of Canada. It is a valuable tabulation of statistics and deserves a place in every oil library.

Each state is treated in great detail, beginning with a summary of the drilling activity during 1957, statistics of well completions, etc. Each area is preceded by a state map and individual field maps are generously sprinkled throughout the text.

Volume 1 contains a listing of all stock-market quotations on listed oil companies for the year 1957; this shows the high and low for the year as well as the last quoted price for 1956 and 1957.


HOH*

GLUCOSATES*

*Improved Through Research*
*Proven By Performance*
*The Best For Your*
*Water Treating Problems*

WE READ WATER* H-O-H ESTABLISHED 1931

*Write for literature on your letterhead.*

*REG. U.S. PAT. OFF.

D. W. HAERING & CO., INC.
ANALYSTS · CONSULTANTS · MANUFACTURERS
P. O. Box 10337
San Antonio 21, Texas

New Wabash line will employ advanced

# Automatic and remote flow control

**Remote operation makes use of station-selection facilities which provide the dispatchers with pressure, temperature, and gravity information.**

WHEN COMPLETED, Wabash Pipe Line Co.'s products-line system will consist of approximately 350 miles of 12-in. line from Robinson to Champaign, Ill., and from the Wood River, Ill. area to Champaign and on to Griffith, Ind.

The stations on this line will consist of two 1,250-hp. motor-driven centrifugal pumps in series, with the necessary auxiliaries, control devices, and telemetering equipment. One of the 1,250-hp. units will use a variable-speed fluid drive for pump-speed control and, therefore, pressure and flow control. The variable-speed drive gives substantial power savings over the use of throttling valves.

Electronic pressure transducers, recorders, and accessory equipment are used to indicate and record pressure and motor load, make contacts on high or low pressures or differential pressures as need be, and funish the proper signal to the electro-hydraulic actuator for speed control.

BY F. A. MOORE AND
J. S. LAVENDER, JR.
Pipeline Engineering and Communications Supervisors, Ohio Oil Co.

### Start-up Sequence

Sequence control at the station is as follows:

High pressure in the main line (when the booster station is off the line) indicates a need for greater flow. An electronic alarm relay, sensing the signal from the proper pressure transducer, makes a contact which:

Opens bypass line valves.

When these valves are fully open, mainline divider valve closes.

The main product is now directed into the station.

When the divider valve is fully closed, variable-speed unit suction and discharge valves open.

When suction and discharge fully open, pump-case-bleed solenoid opens for timed period.

When bleed valve closes, variable-speed unit motor started.

Timer in constant-speed unit starting scheme starts, which is in series with high differential start-up switch for constant-speed unit to hold constant speed unit off line until demand period for variable start-up is over.

The control equipment brings the pump speed up as quickly as possible to lower the station suction pressure to the set point. If motor load or discharge pressure tend to exceed their respective set points, the control equipment will override the suction pressure controller signal and slow the unit down.

The variable-speed low differential-pressure-shutdown contacts are held out of the circuit for a timed period to allow time for line pack and sufficient pump speed.

When the differential pressure between the station suction-controller set point and the actual station suction pressure rises above zero, two conditions are indicated:

1. Variable speed unit is at full speed.

*(Continued on page 178)*

# PUT FLEXITALLIC IN THE "PRINTS"

## For Sealing Performance You Can Depend On

For nearly fifty years, there has been one uniquely resilient seal with a spring-action that adjusts to every change in operating conditions. It's the Flexitallic Spiral-Wound Gasket ... identified for engineers by the blue dye in the Canadian asbestos filler.

In Flexitallic Spiral-Wound Gaskets, compression response is directly related to bolting for each application. With the desired gasket design determined, exacting mechanical controls assure that manufactured gaskets conform to specification.

Flexitallic Spiral-Wound Gaskets serve under the most rigorous operating conditions — from vacuum to 6,000 lbs., from extreme sub-zero to 2000°F. The amazing flexibility of the Flexitallic Gasket makes flanged joints leak-proof even after severe thermal shock, vibration, chemical attack, and cyclic operation.

That's why: for sealing performance you can depend on, it pays to put "Flexitallic" in the blueprints.

FLEXITALLIC GASKET CO.
8th & Bailey Sts. Camden 2, N.J.

Flexitallic®
SPIRAL-WOUND GASKETS

FOR PIPE FLANGES, PRESSURE VESSELS AND PROCESS EQUIPMENT

*Flexitallic is a registered tradename. No one else can make a Flexitallic Gasket. Look for *Flexitallic Blue* — it's our exclusive blue-dyed Canadian asbestos filler.

How to CONTROL and ALARM the TOWER LIGHTS of UNATTENDED Microwave and Communication Stations

PHOTO ELECTRIC PANEL
Automatically turns Tower Lights ON and OFF in accordance with FCC regulations
FLASHER PANEL - Automatically flashes Beacon Lamps — with balanced load provisions.
ALARM PANEL - Automatically provides signals indicating failure of any lamp, power or control.

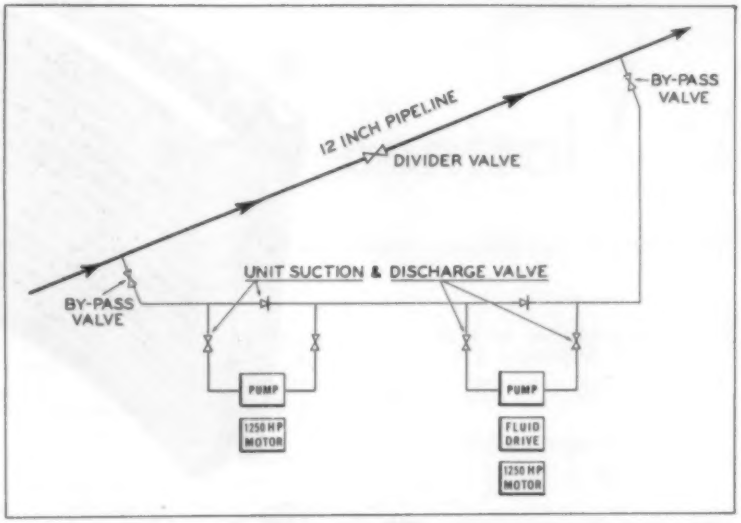
Model LC 201
TOWER LIGHTING CONTROL UNIT
(for Two Light Levels)
Model LC 101 (for Single Light Level)
Model LC 301 (for Three Light Levels)
Models also available with separate Alarm Signal for each Beacon Lamp.
Write for descriptive Bulletins

HUGHEY & PHILLIPS, INC.
Manufacturers of
300MM Beacons, Obstruction Lights, Photo-Electric Controls, Beacon Flashers, Special Junction Boxes, Microwave Tower Light Control & Alarm Systems, Remote Lamp Failure Indicator Systems, and Complete Kits for: Tower Lighting, Sleetmelter Power & Control.
3200 NORTH SAN FERNANDO BLVD.
BURBANK, CALIF.

LONE STAR
IS EQUIPPED TO HANDLE

★ ANY SIZE PIPE PROJECT
★ CROSS COUNTRY PIPE LINE CONSTRUCTION
★ PIPE LINE RIVER CROSSINGS
★ TAKING UP AND RECONDITIONING OLD PIPE LINES

LONE STAR
PIPE LINE
CONSTRUCTORS, INC.
Paul R. Halbert N. K. McFarland
OFFICE AND WAREHOUSE
10301 SHADY TRAIL
DALLAS 20, TEXAS PHONE FL 7-2833




**TYPICAL** station schematic layout of Wabash Pipe Line Co.

2. More pressure should be generated.

Therefore, when this differential reaches some value, say 100 psi., the constant-speed unit starting sequence begins:

Constant-speed unit suction valve opens.

When suction is fully opened, pump bleeder opens for timed period.

When bleeder closes, constant speed unit is started and its discharge valve opens.

Both units are now on the line and the variable-speed unit is running at a speed which will hold the suction pressure at the set point as long as discharge pressure or motor load set points are not exceeded.

### Shutdown and Protective Devices

On normal shutdown with lowering flow, less pressure need be generated by this station; and as the variable-speed unit slows down to keep the station suction pressure at the set point, the differential pressure across the unit will drop.

When this differential pressure drops to 150 psi., the constant-speed unit will be shut down.

When the constant-speed unit drops off the line normally or on trouble, unit suction and discharge valves close.

When both valves are fully closed, pump case is bled.

When the variable-unit differential pressure drops below 100 psi., unit suction and discharge valves close and pump case is bled as above.

When all four unit valves are closed, divider valve opens.

When divider is fully open, bypass line valves close.

Electronic alarm relays will also:

- Shut down constant-speed unit if its suction pressure drops below 30 psi.
- Shut down variable-speed unit if its suction pressure drops below 15 psi.

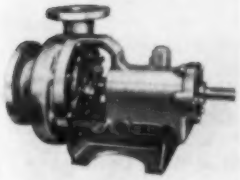
Individual units are shut down and locked out on:

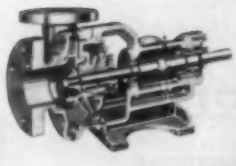
S. E. HUEY & CO.
ENGINEERS & SURVEYORS
OUACHITA BANK BLDG.
MONROE, LA.

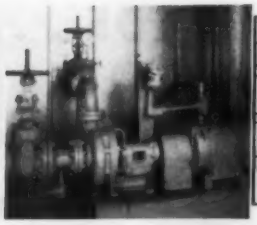
SURVEYING & MAPPING

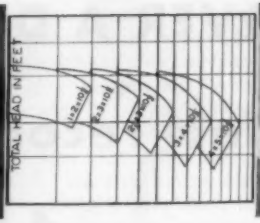
PIPE LINE SURVEYS

CAPACITY
SACHSE ELECTRIC INC.
BATON ROUGE LA.









***BECAUSE...***

**PEERLESS CHEMICAL PUMPS:**

**MEET** critical standards of construction, you benefit from longer pump life, less maintenance, and sharply reduced incidence of system shut down caused by pump failure. Top quality Peerless construction means a dependable, rugged pumping unit you can count on to stay on the job for years longer.

**PROVIDE** proved operating history, you benefit from the knowledge that you're not buying a pump in the dark. Analysis by Peerless of customer pump operating records allows continuous product improvement. Correlation of this data provides Peerless with answers to nearly all field pumping problems.

**OFFER** optimum performance range, you benefit from the economical performance only the exact pump for the job can give you. The Peerless process pump line of over 78 models, sizes and frames, plus thousands of combinations, assures you of pinpoint pump selection that effects direct savings in cost.

**EMBODY** benefits of research in all areas of design, construction, and application. Typical of the many considerations in the design and manufacture of a Peerless pump is the ascertaining of effects of radial loads. **An interesting 8 page booklet discussing this phase of pump design is available to you upon request.**

*Engineers and Pump buyers say:*

# NOW WE CAN BE SURE!

*...buy and apply* PEERLESS PUMPS

*Putting Ideas to Work*

fmc FOOD MACHINERY AND CHEMICAL CORPORATION

**Peerless Pump Division**

Plants: LOS ANGELES 31, CALIFORNIA and INDIANAPOLIS 8, INDIANA

Offices: New York; Atlanta; St. Louis; Phoenix; San Francisco; Chicago; Fresno; Los Angeles; Plainview and Lubbock, Texas; Albuquerque.

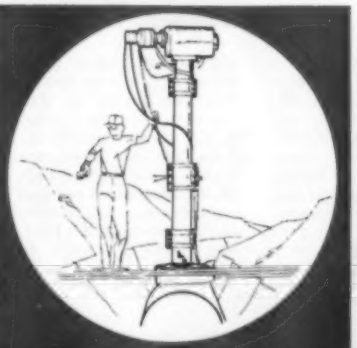
Distributors in Principal Cities. Consult your telephone directory.

# FOR OVER A DECADE . . .

## A perfect record of performance & *SAFETY*

ON PIPELINES

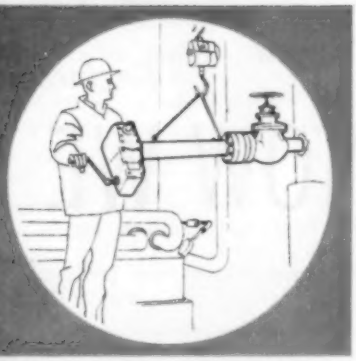
SAFE TAPS INTO:
- STEAM
- ETHYLENE



IN PROCESS PLANTS

SAFE TAPS INTO:
- NATURAL GAS
- NITROGEN

**WmSON-HILLCO**
**TAPPING MACHINES**



SAFE TAPS INTO:
- PROPANE
- GASOLINE

SAFE TAPS INTO:
- OIL
- SALT WATER

4 Machines:

MODEL 1200 — 12" thru 36" taps

MODEL 660 — 3" thru 16"

MODEL 360 — 1" thru 6"

MODEL 100-C — ½" thru 2"

**PROVEN** *by thousands of hot taps . . . This experience means SAFETY for the protection of lives and property.*

EACH MODEL RATED AT:
1440 PSI @ 100° F or
700° F @ 700 PSI
*EACH MACHINE TESTED TO 2,175 PSI*

Write for Rental – Purchase Information

"PIONEERS IN PIPELINE EQUIPMENT"

**T.D. Williamson, Inc.**

P. O. BOX 4038 TULSA 9, OKLAHOMA

Representatives: HOUSTON • AMARILLO • JOLIET, ILL. JACKSON, MICH. • LONG BEACH • SAN FRANCISCO BARTLESVILLE, OKLAHOMA • SEATTLE • SALT LAKE CITY • EDMONTON • TORONTO • VANCOUVER BUENOS AIRES • MONTERREY AND MEXICO CITY CABIMAS, ZULIA VENEZUELA • DURBAN, NATAL, S. AFRICA • PARIS, FRANCE • SYDNEY, AUSTRALIA

- High bearing temperature (each bearing).
- High pump-case temperature.
- Seal failure.
- High motor-winding temperature.
- Motor overload.
- Phase current unbalance.
- Incorrect suction and discharge-valve position.

Shut down and indicate only—each unit:

- Low suction pressure.

Station shut down and lock out on:

- High discharge pressure.
- High sump level.
- Loss of control voltage.
- Incorrect bypass and divider-valve position.
- Fire.

### Remote Control

Complete control of the line will be available at the dispatching center in Findlay, Ohio. Ohio Oil Co.'s microwave system will provide the communications link allowing dispatching personnel to:

...**Read station suction** and discharge pressures.

...**Start any unit** provided all other conditions but normal starting pressure are satisfied.

...**Stop and lock out** each unit.

...**Receive alarm indications** in case of unit or station lockout.

...**Receive flow-meter readings** together with time, temperature, and other variable data on demand.

Dispatching personnel will also be able to adjust the station suction-pressure-controller set point from Findlay, thereby changing line-flow capabilities while making sure that the line is operating efficiently.

The supervisory control allows the dispatcher to level off demand charges, spread power use over the line during periods of low power consumption and prevent on-off cycling between stations at certain critical flows.

The suction and discharge pressures are translated to mechanical motion by the use of a bourdon tube. This varies the bias on an oscillator and produces a d.c. current in proportion to the pressure applied. The face of the meter reading this current is then "swept" by a beam of light. The position of the hand is thus determined and transmitted to the Findlay office where a receiver causes this position to be duplicated on a local meter.

The supervisory is tone-operated and is of the select-before-operate variety. That is, a tone is initially sent out which, arriving at the remote point, effectively checks the circuitry, sets up the desired function, triggers another tone after doing so, and transmits the second tone back to the dispatching center.

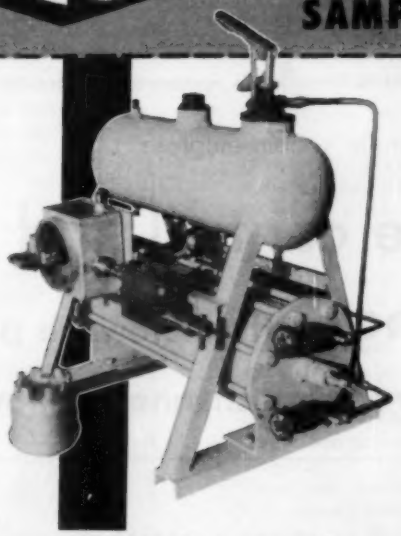
Reception of flow-meter readings is accomplished by a device which accepts and totalizes a pulse input and produces coded pulses corresponding to teletype code. It is actuated upon reception of an interrogation pulse from the dispatching center. The information is then transmitted to a teletype machine at the dispatching center.

Set point adjustment will make use of relatively new equipment which is motor operated. The two motors are actuated locally by choice of either an "up" or "down" push button.

Remote operation makes use of station-selection facilities whose primary function is to provide the dispatchers with pressure, temperature, and gravity information. Frequency shift is then employed to close a parallel contact for either greater or lesser pressure as desired.

Since the operation of the set-point device is very slow, the pressure may be monitored and the action stopped with a large degree of safety. Alternately, since it is known to change at the rate of about 12 psi. per minute, a time clock with the face calibrated in psi. may be used, making the entire operation automatic.


MECO PROPORTIONAL PIPE LINE SAMPLER



Withdraws composite sample of pipe line fluid at rate proportional to pipeline flow.
- Sample stored at pipeline pressure.
- Variations in line pressure have no effect on operation.
- Wide flexibility — 5 samples per bbl. to 1 sample per 42 bbls.
- Paced by Positive Displacement Liquid Meter.
- Sampler furnished completely assembled and mounted on sturdy base.

MECO Pipe line Sampler consists of a Pilot Type transmitter mounted on and paced by a positive displacement meter.
- An adjustable proportioning slide valve — operates in clean oil.
- Sample cylinder (single or dual) with piston position indicating rod.
- A clean oil reservoir.

Pipe line sampler available to 600 psig operating pressure.

for perfect PIPE LINE SAMPLES
specify MECO PIPE LINE SAMPLER

MECO
MAINTENANCE
Mechanical CORPORATION
SUBSIDIARY OF
P. O. BOX 1697 2141 CLINTON DRIVE
PHONE CA 2-3231 HOUSTON 26, TEXAS

**TYPICAL REMOTE** station is represented by Groveton, Tex., installation on Magnolia Pipe Line.

Expanded Magnolia system employs

# Remote control and gaging, automatic blending, with microwave providing voice and supervisory control channels. Innovation: dual sensing of leakage

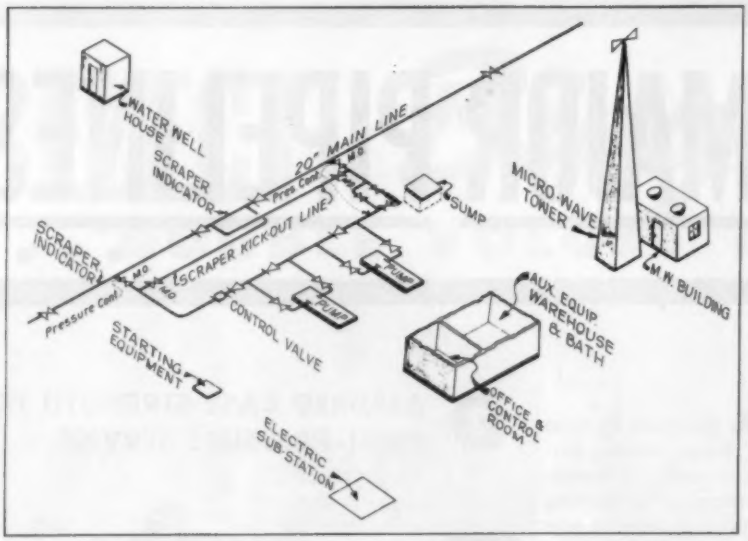
**SPUTNIK VIEW** of microwave and pump stations from Dallas to Beaumont. Fig. 1.

BY GEORGE J. DORRIS, Jr. and G. A. LUNDBERG
Magnolia Pipe Line Co.

THE NEED for additional crude at Magnolia's Beaumont refiney has caused Magnolia Pipe Line Co. to expand its pipeline system from Corsicana to Beaumont and increase delivery facilities at the refinery.

At present, there is a 205-mile, 20-in. line with two pump stations between these two points. The initial station at Corsicana is manually operated and the midpoint station at Groveton is remotely controlled via telephone line from Corsicana. This system is being expanded from 175,000 to 250,000 bbl. per day by the addition of two stations, one at Grapeland and one at Bragg.

Also, at the present stations, pump capacities and other facilities are being increased. At Corsicana four 176,000-bbl. floating-roof tanks are being constructed and larger suction

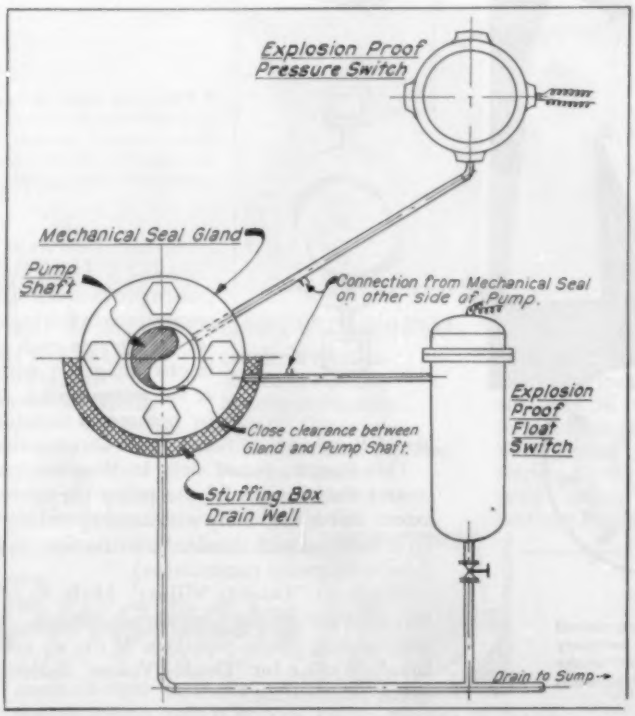



**REMOTE STATION LAYOUT** is shown in schematic drawing. Fig. 2.

lines laid. New tank-farm booster pumps have been installed to supply oil to four 2,000-hp. centrifugal pumping units on the main line.

The pumping units on the tank farm are to be remotely controlled from the main pump house with the suction and discharge pressures being telemetered into the control room. Other features of the tank farm are remote-controlled valves, automatic blending of crudes, and remote gaging of all the tanks.

Fig. 1 gives a sputnik view of how the stations, pipeline, and microwave towers are laid out across part of Texas, with an extension of the communication system into the central office in Dallas. Over the microwave system will be channels for voice and supervisory control of the pipeline system with space for future control


Explosion Proof Pressure Switch
Mechanical Seal Gland
Pump Shaft
Connection from Mechanical Seal on other side of Pump.
Explosion Proof Float Switch
Close clearance between Gland and Pump Shaft.
Stuffing Box Drain Well
Drain to Sump

**MECHANICAL SEAL** leakage will be sensed either as pressure in the gland housing or excess flow from the seal drain. Fig. 3.

**THE AUTHORS**

**G. J. DORRIS, JR.** **G. A. LUNDBERG**

George J. Dorris, Jr., is senior communications engineer for Magnolia Pipe Line Co. A Texas A. & M. graduate, he worked for Westinghouse Electric Corp., Houston Lighting & Power Co., and American Oil Pipe Line Co. before joining Magnolia in 1956.

G. A. Lundberg is senior mechanical engineer with Magnolia Pipe Line Co. He, too, is a graduate of Texas A. & M., with a B.S. in mechanical engineering.

of other stations as described more completely below.

### Control of Pipeline Operations

Corsicana station will be the controlling station for this expanded system, and the personnel there will operate the other three stations remotely by means of supervisory control and telemetering over the microwave system. From Corsicana, each unit at a remote station can be started or stopped and all of the station's block valves can be opened or closed.

A separate channel is provided for each pressure so that the station suction pressure, pressure upstream from the control valve, and station mainline discharge pressure is continuously indicated at Corsicana. There are visual and audible alarms that indicate power failure, channel failure, uncalled for shutdowns, and all uninitiated actions for each remote-controlled station.

When a station is shutdown automatically due to the function of a safety device, this information is transmitted to Corsicana and indicated as either a catastrophic type of failure or as a temporary-type failure. If the failure is a catastrophic type—seal, failure, too-high sump level, air failure, or a manual shutdown with the emergency shutdown button—the station is locked out and cannot be restarted without the malfunction being manually corrected.

If the station failure is of the temporary type, the station can be restarted remotely if and when the fault corrects itself. Failures of this type are: high main-line pressure and pump discharge pressure; motor-winding temperature; low pump suction; phase unbalance and thermal overload on motors.

The control room at Corsicana is

# 2 BIG REASONS WHY MAJOR PIPELINES

**1 LOW MAINTENANCE.** Bingham Pipeline Pumps are of "Double Volute" design, insuring perfect hydraulic radial balance of rotating element. "Hydraulic Radial Balance" eliminates unequal pressures on the rotating element—**"Side Push"**—which is the primary cause of wear and maintenance in conventional pumps. Also this feature, which eliminates shaft deflection, permits **mechanical seals** to establish and maintain uniform track between the contacting faces. This prevents leakage and seal face wear, resulting in *long seal life.*

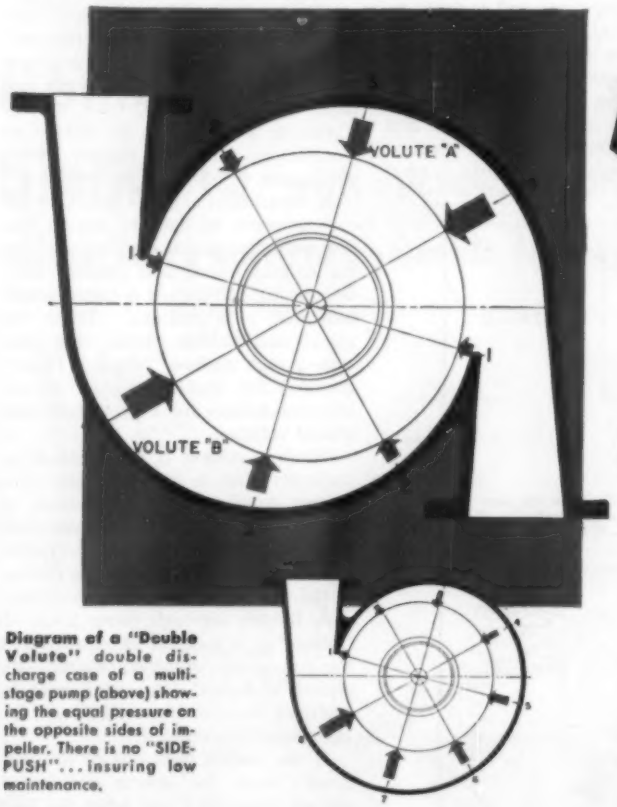
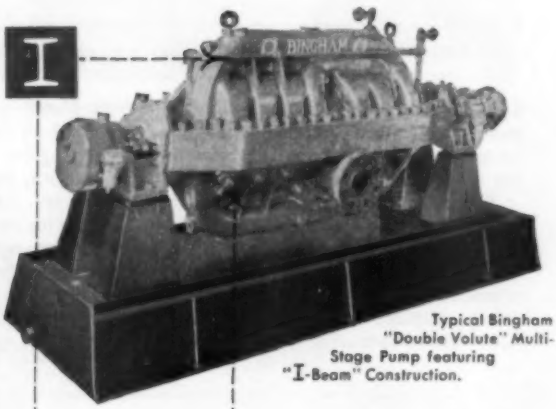


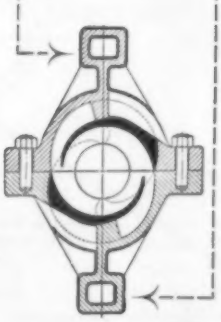

**Diagram of a "Double Volute"** double discharge case of a multi-stage pump (above) showing the equal pressure on the opposite sides of impeller. There is no "SIDE-PUSH"... insuring low maintenance.

**Diagram of "Single Volute"** pump case (immediately above) showing unequal pressures at opposite points around the periphery of the impeller. These unequal pressures cause "SIDE-PUSH" on the rotating elements, causing wear of rotating parts and, frequently, high maintenance.

**2 ASSURED CASE STRENGTH FOR HIGH-PRESSURE SERVICE**



Typical Bingham "Double Volute" Multi-Stage Pump featuring "I-Beam" Construction.



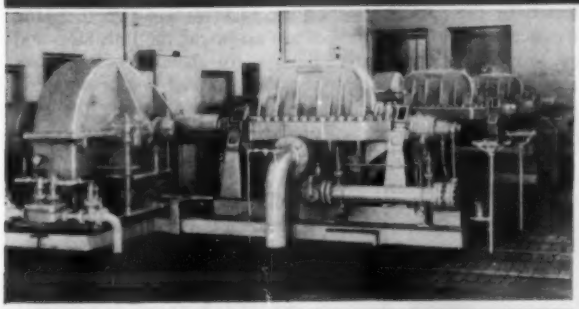
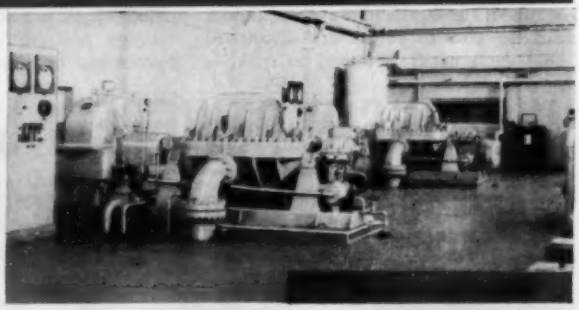
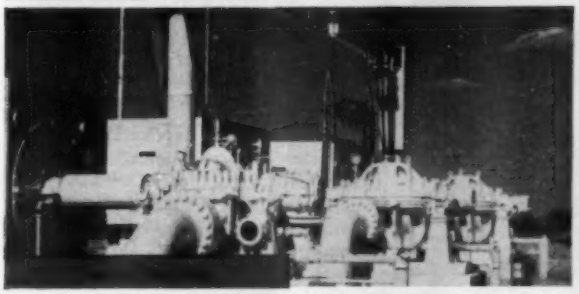
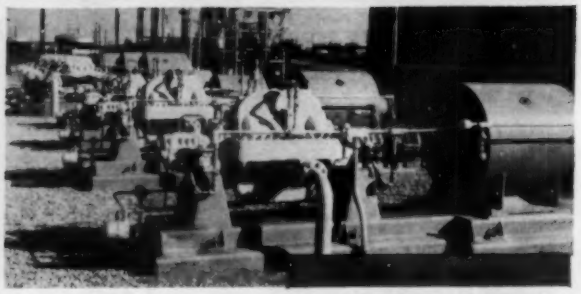
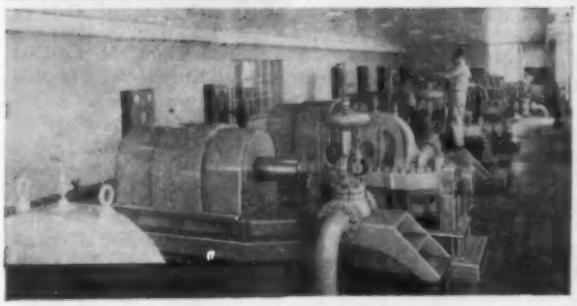
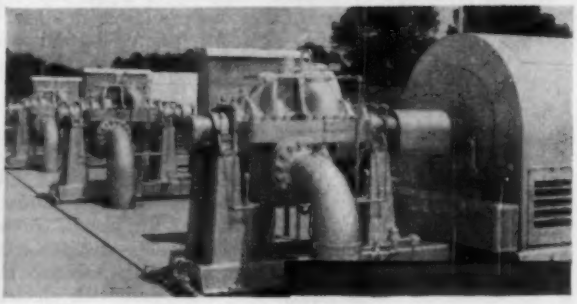
**A transverse cross-section** of Bingham "Double Volute" Multi-Stage Pumps, showing identical cross-overs cast integrally with the upper and lower halves of the pump casing.

Integral cross-overs in Bingham "Double Volute" multi-stage pumps produce casings of maximum strength for high pressure service because each cross-over is cast integrally with its half of the pump casing, and thereby becomes a structural member of Bingham's "I-Beam Truss Construction".

This feature, found only in Bingham pumps, increases the strength of the pump casing to such an extent that it can safely withstand operating pressures up to 2000 psi with standard construction (higher pressures with special construction).

Bingham "Double Volute" Multi-Stage Pumps will best serve your pipeline operations, as they are now serving major pipelines. Write to your nearest Bingham office for "Double Volute" Bulletin or additional information.

# SELECT *Bingham*
## . . . "DOUBLE VOLUTE" PUMPS

**PARTIAL LIST OF MAJOR PIPELINES WITH BINGHAM "DOUBLE VOLUTE" PUMPS IN OPERATION OR ON ORDER**

- Ashland Oil Pipe Line
- Buckeye Pipeline
- Continental Oil Pipeline
- Esso Standard Oil Pipeline
- Getty Oil Company
- Great Lakes Pipeline
- Interprovincial Pipeline
- Interstate Pipeline
- Lakehead Pipeline
- Magnolia Pipeline
- Minnesota Pipeline
- Ohio Oil Company
- Okla-Miss. River Pipeline
- Pasotex Pipeline
- Pembina Pipeline
- Phillips Pipeline
- Plantation Pipeline
- Salt Lake Pipeline
- Shamrock Oil Company
- Service Pipeline
- Shell Pipeline
- Sinclair Pipeline
- Sohio Pipeline
- Southern Pacific Pipeline
- Standard Oil of Ind. Pipeline
- Sun Pipeline
- Texas Company
- Tidewater Assoc. Pipeline
- Trans-Mountain Pipeline
- Trans-Northern Pipeline
- Tuscarora Pipe Line
- Union Oil Pipeline

*Bingham* PUMPS
SINCE 1921

DOUBLE VOLUTE RADIAL BALANCE

**BINGHAM PUMP COMPANY**
*General Offices:* 2800 N.W. Front Avenue, Portland 10, Oregon
*Factories:* Portland, Ore. • Vancouver, B. C., Canada

**SALES AND SERVICE OFFICES**

BOSTON, MASS.
CHICAGO, ILL.
CLEVELAND, OHIO
DALLAS, TEXAS
DENVER, COLO.
HOUSTON, TEXAS
KANSAS CITY, MO.
LOS ANGELES, CALIF.
NEW ORLEANS, LA.
NEW YORK CITY, N.Y.
PHILADELPHIA, PA.
PITTSBURGH, PA.
SAN FRANCISCO, CALIF.
SEATTLE, WASH.
ST. LOUIS, MO.
ST. PAUL, MINN.
TULSA, OKLA.
TORONTO, ONT., CAN.
VANCOUVER, B. C., CAN.

arranged so that the operator can see all the activities within the station and also keep posted on the status of the remotely controlled stations. There is a separate control panel for each station as well as for the Corsicana tank farm which has many remote-control features.

### Remote-Controlled Stations

Each station panel has a mimic of the station pumps, valves, and piping with indicating lights to show the status of the equipment at that station. All the control panels are so aligned that each panel is joined to make a continuous mimic of the whole system.

Each of the remote controlled stations is what the industry commonly calls an "outdoor" station. The pumps, motors, starters, and piping are not housed; however, some of the auxiliary equipment such as the air compressor, batteries, battery charger, control panel, air dryer, and supervisory control equipment is housed in the office-warehouse building.

There are three buildings at these stations of matching architecture and color which are located in the same relative position at each site. The two main buildings are the microwave-equipment building and the office building. The latter is divided into three rooms, one for the warehouse and auxiliary equipment, one for the office and control section, and the last for the bath.

The control panel at each station is built into and flush with a dividing wall between the control room and the warehouse section of the main building. On this board is a mimic of the station with indicating lights to show the open or closed position of the station valves and whether the motors are on or off the line, stop and start buttons for the two units, open-close buttons for all motor-operated valves, and lights indicating the passage of the scraper by the station.

The station pressures are transmitted to this panel by telemetering equipment and the functioning of safety devices is transmitted to an annunciator which reveals the location of trouble should the station be shut down by one of the automatic safety devices. At each station a transfer switch is provided to transfer from local to remote operation.

### Mechanical Seal Detector

Nearly all the applications of the electrical and mechanical equipment are identical to those normally used in the industry. However, one innovation is a dual sensing of leakage from the mechanical seals of the pumps. As the sketch shows, excess leakage will be sensed either as pressure in the gland housing or as excess flow from the seal drain. In previous flow-sensing installations, false trouble has caused shutdowns because restricted areas have paraffined up, indicating excessive flow from the seals.

It is hoped that this new arrangement will prevent such trouble. The idea of the pressure device has been used before, but it has not given all of the protection desired. With the pressure-sensing device included with the flow-sensing device the shutdown time of a unit will be quicker in the case of a large seal leak than would otherwise be experienced. This rapid shutdown could also eliminate spillage of oil which is a great fire hazard.

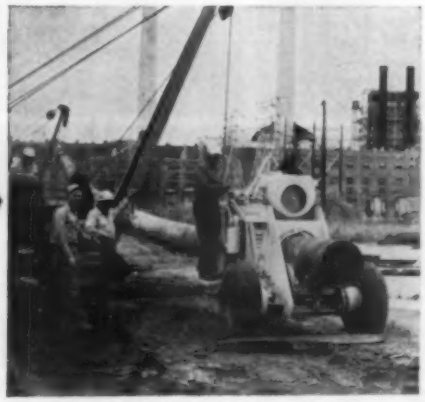
In studying the dagram it should be noted that it is possible to operate the pumping units even when a seal might be leaking excessively. Purpose for this arrangement is that rarely is it possible to replace a seal when serious leakage begins; maintenance men must be notified and travel a considerable distance to make the necessary repairs. This arrangement should permit minimum shutdown time and maximum safety.

The microwave system under construction to serve the three booster


# WISCONSIN-POWERED Machine

**Bends Pipe to Fit Terrain**

**...at Pressures Up to *250 TONS!***



HANDLING pipe of any size from 6-in. to 20-in. dia., and up to ½-in. thick in the largest size, this Wisconsin-powered "CINCH WV Series" Vertical Pipe Bending Machine makes practically any desired bend . . . tailor-made to fit the terrain and the contour of the space for laying the pipe.

Even on the greatest angles of the bends, the pipe thickness is kept uniform and free from ripples or wrinkles, according to the manufacturer, M. J. Crose Mfg. Co., Inc., Tulsa, Okla. The actual bending operation is performed by four hydraulic cylinders which exert pressures up to 250 tons at the places where pipe is to be bent. The hydraulic pump which activates the cylinders, is powered by a MODEL VG4D (37 hp.) WISCONSIN HEAVY-DUTY AIR-COOLED ENGINE, equipped with electric starting and generator.

In addition to its value in oil field service, this machine is said to be an ideal piece of equipment for medium or small-sized contractors, as a permanent investment. It is not uncommon to see one of these small bending machines operating on busy thoroughfares in metropolitan areas, where until recently only fittings or welding methods were used.

Wherever there's a tough power job to be done, you'll find Wisconsin Engines (3 to 56 hp.) delivering High Torque, Load-Holding power service . . . operating at temperatures from low sub-zero to 140° F. *You* can't do better than to specify "WISCONSIN" for *your* equipment. Write for Engine Bulletin S-223.

**WISCONSIN MOTOR** Corporation
MILWAUKEE 46, WISCONSIN
*World's Largest Builders of Heavy-Duty Air-Cooled Engines*

WRITE TO HARLEY SALES CO.
619 SOUTH MAIN STREET • TULSA, OKLAHOMA
5420 RICHMOND AVENUE • HOUSTON, TEXAS
905 SOUTH MAIN STREET • WICHITA, KANSAS
OIL FIELD DISTRIBUTORS FOR WISCONSIN ENGINES AND ALL TYPES OF UTILITY UNITS

A8-6207

stations will extend from Corsicana into Dallas and beyond Bragg station into the Beaumont refinery. These extensions will enable the microwave system to be used for through communication between Dallas and Beaumont. The entire system will be 260 miles in length being covered in 11 microwave paths. Intially, the system will consist of:

1. Ten voice channels from Dallas to Beaumont (3 of these 10 channels will be connected to existing wire-line channels to Houston).
2. Three voice channels from Dallas to Corsicana.
3. One pipe-line-operation voice channel between Corsicana and Beaumont with voice dropouts at the three booster stations.
4. One pipeline-operation supervisory-control and telemetering channel, the features of which shall be discussed below.
5. One service channel with drops located at all microwave stations.

Complete RF-IF hot standby units with bilateral automatic switching will be provided for all microwave stations. Master alarm detectors at Dallas, Corsicana, and Beaumont are provided for the following faults at each station:

1. Failure of tower top lights.
2. RF-unit failure, east, including the unit in reserve service.
3. RF-unit failure, west, including the unit in reserve service.
4. Commercial a.c. power failure.
5. Emergency-power-unit failure.

The wire chief located in Dallas will normally receive the fault alarms. All microwave stations are being provided with an emergency power supply. In order to eliminate normal switchover and starting time of standard emergency power supplies, station power will be generated by a motor-driven alternator. If the normal a.c. power source fails, an electrically operated clutch connects the alternator to an LPG engine.

The alternator shaft has a heavy flywheel to provide the necessary engine-cranking force and to stabilize the normal voltage output of the alternator. The voltage output of the alternator will be satisfactory for use by the microwave equipment without a voltage regulator. To insure the maximum reliability of the entire system, the atmospheric environment inside each microwave station will be completely enclosed and regulated.

### Connecting Supervisory Control to Microwave

To eliminate the possibility of the communiaction channel from either adding or modifying pulses transmitted for supervisory-control purposes, considerable attention has been devoted to the method of connecting this equipment to the micowave system. The method selected uses a frequency-shift channel with a separate squelch unit. The squelch unit is able to block the erroneous pulses because it operates faster than the frequency-shift channel and is slower to recover after abnormal conditions.

The squelch circuit operates when one or more of the following conditions occur:

1. Loss of channel signal, regardless of noise magnitude.
2. Signal-to-noise ratio below present standard.
3. Loss of all signals in the presence of noise.
4. Entire audio channel absence.
5. Loss of primary power to unit.
6. Filament failure of any tube in the unit.

The transmitting contacts of the supervisory-control equipment will have normally open contacts. These contacts will close when the supervisory-control equipment is coded. A "space" frequency is transmitted when the transmitting contacts of the supervisory control are open and a "mark" frequency when the contacts are closed.

With this arrangement the super-


PROVED BY MILES & MILES & MILES &

**Manhattan Aladdin**

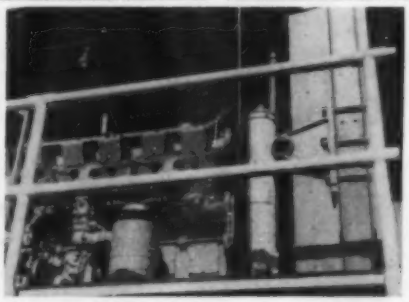
TRANSCONTINENTAL GAS PIPE LINE CORPORATION

Up East millions of people simply turn a knob to conjure up a genie Aladdin never dreamed of—a genie of warmth and power. In home and industry, Easterners have Texas-Louisiana gas producers to thank for this genie. Transco, like Aladdin's lamp, is happy to carry the genie where the most people are.



**FULL FLOW FILTERS FOR DRILLING RIGS . . Briggs protection means less down-time and fewer stops through ENGINEERED STABILITY**

**STABILIZED FULL-FLOW FILTRATION in any phase of oil production and delivery is important when costs of down-time and frequent cartridge replacement are considered. BRIGGS STABILIZED FULL-FLOW CARTRIDGES are built to prevent costly non-productive time.**



BRIGGS FILTER INSTALLED ON CLIMAX ENGINE ON ROTARY DRILLING RIG.

**THERE IS A Briggs cartridge and filter tank available for your particular requirement. Write for complete resume covering Oil Filters, Filter/Separators, Air/Gas Line Filters . . . no obligation.**

Briggs

**OIL FILTERS**
**FILTER/SEPARATORS**
**AIR/GAS LINE FILTERS**

PRODUCT OF GUNSEL RESEARCH

**THE BRIGGS FILTRATION COMPANY, DEPT. 263, WASHINGTON 16, D. C.**

**YES!** **Send the complete resume of above described. No cost, No obligation.**

**Name** .....

**Company** .....

**Address** .....


visory control must be provided with an external alarm contact to indicate abnormal conditions because the supervisory-control receiver at Corsicana is connected to an open contact during both the normal at rest condition and during the time the squelch unit has operated.

One of the requirements of the supervisory-control system is to provide a channel alarm at Corsicana to indicate when a control channel is not functioning properly. The control channels from the remotely controlled stations to Corsicana are monitored for correct operation by the squelch unit at Corsicana as described above.

Monitoring of the control channels from Corsicana to the remotely controlled stations has been accomplished by connecting the squelch unit at the remotely controlled stations in such a way that the "mark" frequency will be transmitted continuously during abnormal conditions. The design of the supervisory-control equipment for Corsicana was modified so that the receipt of the above described continuous "mark" frequency signal causes the channel alarm to be given.

In this manner, complete monitoring of supervisory-control channels, from Corsicana to the remotely controlled stations and then back to Corsicana, has been accomplished.

In conclusion, it may be stated that everything possible has been done to obtain the maximum **reliability** of the microwave system including voice channels, while the primary design parameter for the individual supervisory-control channels has been maximum **security.**

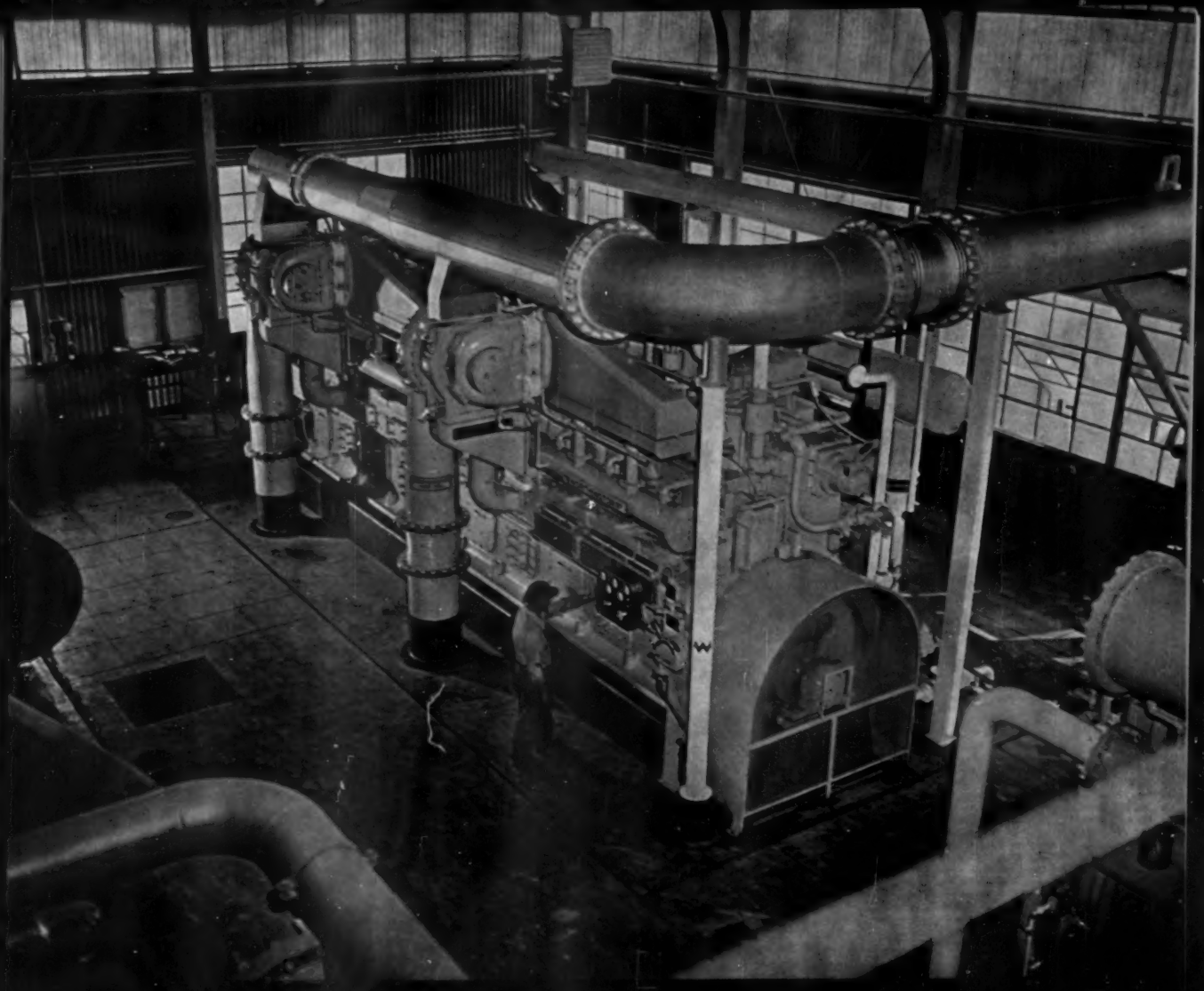
## Russians plan ways to supply Siberia

RUSSIA has several projects in the works for getting oil and gas to Siberian centers.

It says a major refinery is under construction at Krasnoyarsk, Central Asia. This is on the route of the 2,315-mile, 28-in. crude trunk pipeline being built from the Volga River deep into Siberia. Products from Krasnoyarsk will be shipped by pipeline to industrial centers hundreds of miles north.

Two other plants are planned further east, at Transbaikal and Irkutsk. The Irkutsk plant, at the terminal of the pipeline system, will export products to Mongolia and China.

Russia also says it is ready to start work on a natural-gas storage area in a coal mine at Stalinsk, Siberia. A 20-ft. coal seam will store about 165 million M.c.f. of gas for later use by the nearby steel industry.



ANOTHER WORTHINGTON FIRST

# SUTC

## THE ONLY 2-CYCLE ENGINE COMPRESSOR WITH SELF-SUSTAINED TURBOCHARGING!

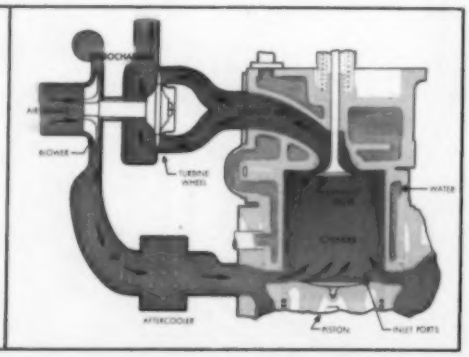
TURN PAGE FOR DETAILS

# WORTHINGTON'S SUTC

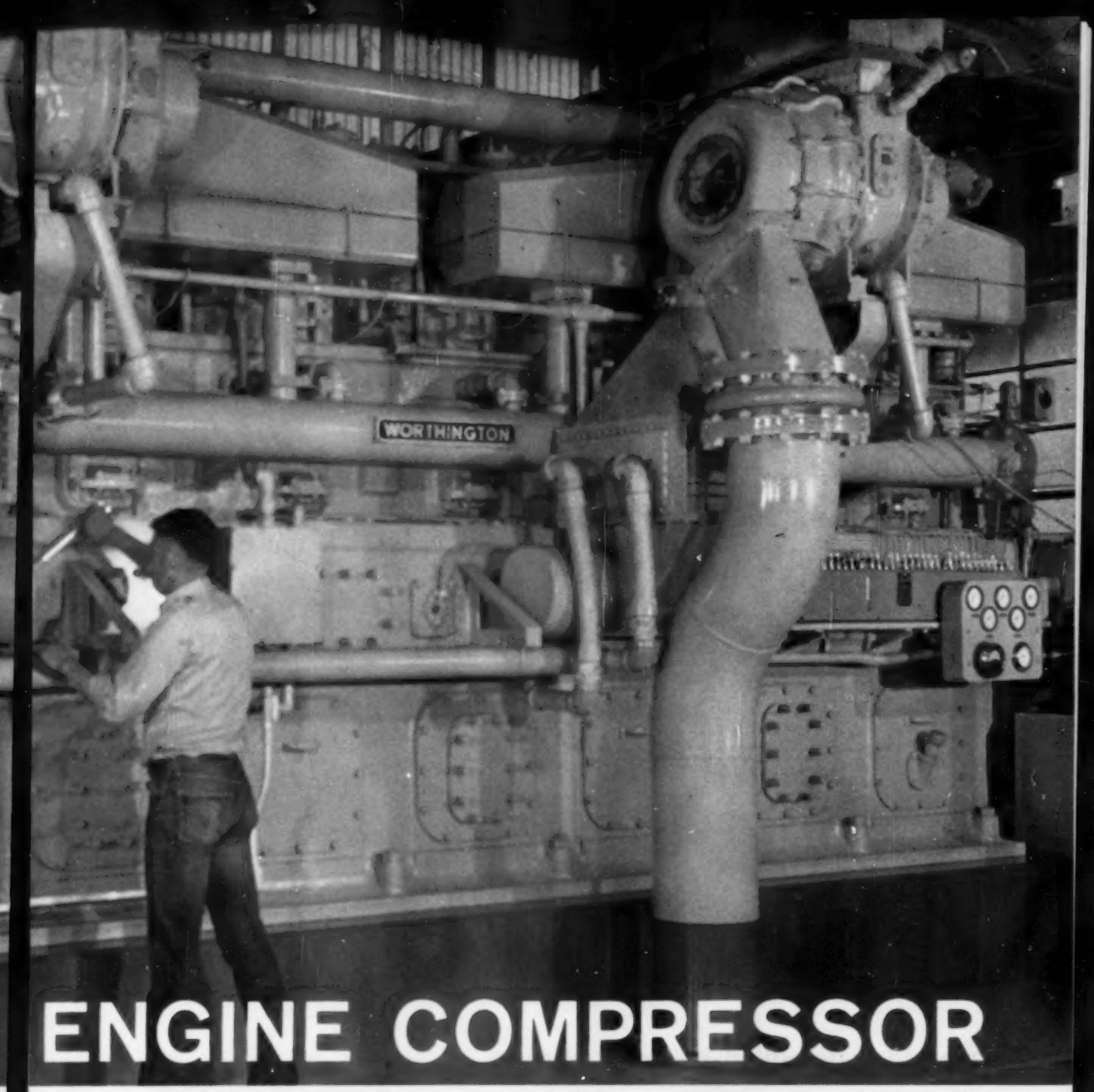
## Easier starting, quicker loading,

**TURBO-UNIFLO OPERATION**

**Straight through flow of air in the cylinder, the large inlet port areas (full 360 degrees), and the timed exhaust valves give maximum scavenging effectiveness with optimum back pressure.**




**Compact, reliable, efficient—the unique SUTC gas engine compressor with independent turbocharging has quickly become the outstanding engine compressor on the market. (Today, SUTC engines are in operation in chemical, petro-chemical plants and in pipeline service throughout the world!) Thanks to the self-sustained turbocharging feature the SUTC develops almost double the hp in the same space required by a non-turbocharged engine. Further, the field-proved Worthington TURBO-**




# ENGINE COMPRESSOR

## most flexible in operation

UNIFLO system provides the most complete scavenging, resulting in a complete absence of residual gases in the combustion chamber.

**Power** — The SUTC integrates exhaust-powered turbocharging with field-proved Uniflo scavenging design for unequalled stability of performance over the complete range of speed and load requirements. The SUTC range: 1250 to 2500 hp. Supplied in 5, 6, 7, 8 and 10 cylinder in-line units.

**Economy**—No engine compressor in this range is more economical. Low fuel consumption stems from the fact that sufficient exhaust gas energy is applied to give full turbocharged effect through *all* speeds and loads without added mechanical means for driving the supercharger.

**Efficiency** — Operating at relatively high compression ratio, the Turbo-Uniflo design affords much smoother combustion characteristics than other engines with lower compression ratios. This is due to the positively controlled timing arrangement, cylinder configuration and design of the exhaust manifolding.

For complete details on the SUTC turbocharged gas engine compressor, call your nearest Worthington District Office, or write: Worthington Corporation, Section 43-2, Harrison, New Jersey. In Canada: Worthington Canada Ltd., Brantford, Ont.

**WORTHINGTON**

compressor-user survey shows

# FEATHER VALVE PREFERRED 2 TO 1!

FEATHER VALVE

VALVE A

VALVE B

A recent survey of compressor users put the amazing Feather* Valve first by far in all four operating categories —simplicity of construction, efficiency, low maintenance cost and quiet operation. In addition, the Feather Valve was picked as the preferred compressor valve 2 to 1 over the nearest competing type of valve!

The lightest, fastest-acting valve available, the amazing Feather Valve provides very sharp action with virtually no slip or back-flow. It works with no impact . . . has no buffer plates or cushioning devices. Practically indestructible it assures long life with negligible maintenance costs. When buying your next compressor, look into Worthington's complete line of Feather Valve units. Worthington Corporation, Harrison, N. J.

*REG. U. S. PAT. OFF.

**WORTHINGTON**

# Preventing dangerous pressure in a pipeline automatically by remote control

**Dangerous high and low pressures in a pipeline segment which can occur a great distance from a pump station can be detected and cause automatic shutdown of the pump station.**

**A command signal consisting of coded pulses is automatically sent over the communication system to the station where it is decoded to effect the shutdown. Dual units are used throughout to insure reliability.**

BY S. M. HAMMER
Senior Engineer, Sinclair Pipe Line Co.

IN MANY RESPECTS the operation of a modern pipeline system is similar to operating a modern automobile. Each concerns the transportation of large loads at relatively high rates of speed. The object, of course, is delivery of the load to a remote destination safely and without incident. Periodic inspection of panel instruments assures the operator that all is running smoothly and delivery can be made at the expected time.

When something goes wrong to interrupt normal operations the condition must be recognized immediately so that protective measures may be used to guard against and eliminate potential hazards.

Usually most hazards are anticipated when components of a system are designed. Protective measures are provided for each phase of the overall operation. Thus, for instance, loss of or disturbance to the electrical power, the hydraulic system and its various operating pressures, and many other changeable factors can be compensated for to provide necessary protection to the system.

In most cases each phase of operation is treated separately. A pump station, like the automobile, is an individual unit performing in its own peculiar environment under specific conditions.

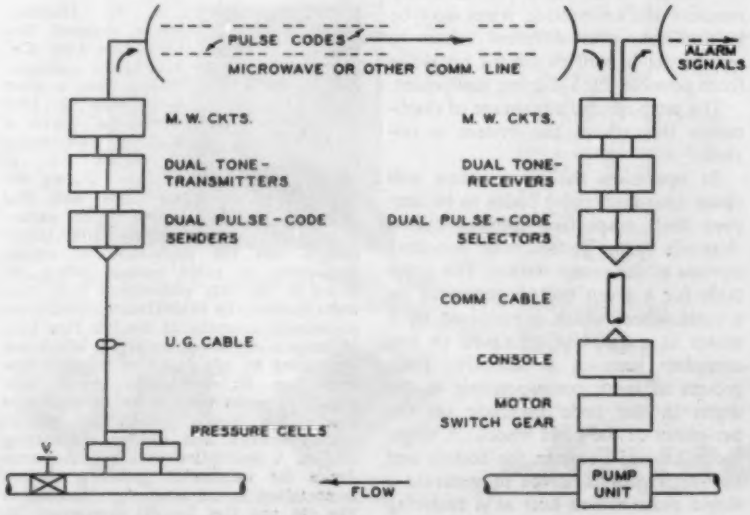
The road or pipeline imposes its own set of problems. Even the remote destination or point of delivery can and does create conditions associated with preceding operation factors.

Relatively sudden increase or decrease in line pressure that occurs close to a station can quickly be detected by sensing devices to cause desired shutdown. Abnormal changes in line pressure could be caused by malfunction of a valve or a break in the line.

However, if such conditions occur at a point in the line a great distance from the station they will not be detected back at the station by instruments. Much time may elapse before the station is notified to shut down. During this time, if there's a break in the line due to a defect in the pipe or accident, expensive damage and loss of oil as well as a potential hazard would be the result.

If a valve becomes closed it can readily be seen that pressure will increase to create a dangerous situation. It is conceivable that in some cases the line may eventually break. Sometimes a bursting head is employed, depending on the area or environment concerned. In any case an undesirable situation must be dealt with.

A device which can prevent such occurrences or at least minimize the aftereffects, depending on the nature of a break, is the subject matter of this article. Following is a description of this device and how it works.




**BLOCK DIAGRAM** of automatic protection of line by remote control against dangerous pressures.

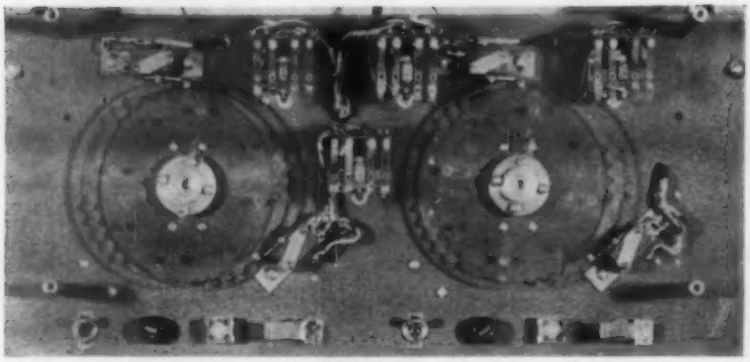
### Remote High-Pressure Shutdown Device

The problem of protecting pipelines which can be subjected to excessive line pressure can be dealt with in a number of ways.

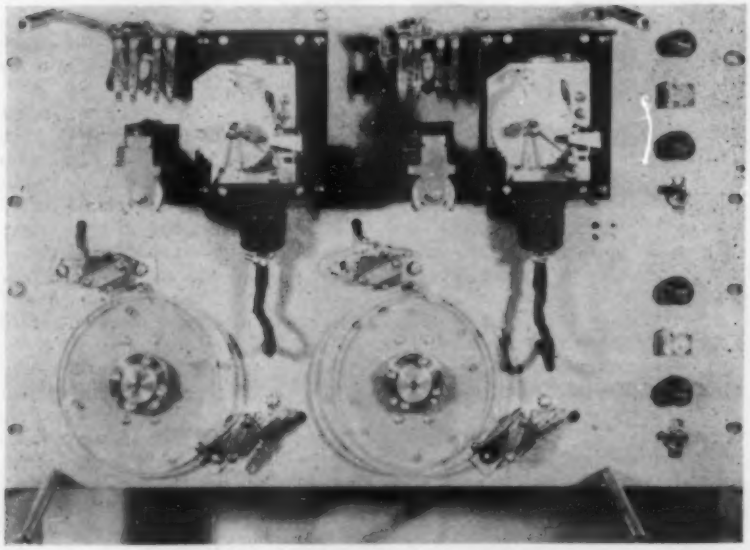
A desirable way would be to install equipment which would operate over a communication channel between two points in the system, such as a delivery point or an upstream pump station.

Reliable means for shutting down a station should be positive in action when required to operate and should not operate when subjected to stray or false signals which could develop from numerous causes.

This device consists of two elements, a transmitting unit associated with a pressure-sensing device attached to the pipeline such as at a



**DUAL TRANSMITTING UNIT** showing code wheels.



**DUAL RECEIVING UNITS** showing selectors.

delivery point, and a receiving unit associated with the control circuit of pump station units.

When required, communincation channelizing equipment is provided for transmitting the necessary signal which is in the form of coded pulses.

### Transmitting Unit

The transmitting unit is effectively a double unit. All components are duplicated to provide two distinct units which operate singly or together over their respective channels. They are controlled by a common pressure-sensing device connected in the pipeline on a selected segment. If desired, a similar device which will respond to a minimum allowable pressure can be installed.

The switch contacts of these devices are connected in multiple to physically protected wires which go underground to the transmitting devices. These, as well as any channelizing equipment that is required, will be located in a communication shack or building which is usually not very far away. As an extra precautionary measure the connecting wires may be in duplicate over different routes to reduce the hazard of circuit breakage from possible ditch-digging equipment.

The purpose and advantage of duplication throughout the system is obvious.

In operation the transmitters will cause four-digit pulse codes to be sent over their respective communication channels to the receivers or decoding devices at the pump station. The pulse code for a given unit is generated by a code wheel which is revolved by a motor at a speed of 15 r.p.m. or one complete turn in 4 seconds. Four groups of teeth corresponding to the digits in the code protrude on the periphery of the code wheel. A single tooth located between the fourth and first-digit groups serves to generate a single pulse which acts as a restoring pulse to the selector in the receiving unit.

## Automatic Control

### Operation

A fuse and power switch are a part of the power circuit to each device. There are two relays which operate from 115 volts a.c. One of the relays is connected for constant operation across the fused circuit.

If a fuse blows, a switch is left open, or if the power to the units fails for any reason this relay will release to close a pair or pairs of contacts which close an alarm circuit to sound a local alarm. If the units transmit over microwave channels the alarm can also be sent over an alarm circuit which is generally provided for alarming tower-light failures.

In this manner a power failure can be made known to an alarm center for a particular location. A neon lamp within easy view on the transmitter panel can be seen any time someone is near the equipment but cannot hear the alarm.

The other relay in the unit will operate if and when the pressure cell closes its contacts. The operating point of the cell is set to a valve exceeding the normal operating pressure but less than a pressure which could break the line.

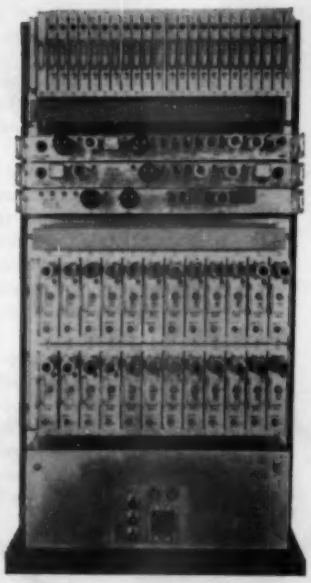
When the relay operates from contact closure in the pressure cell the motor will run to generate the four-digit pulse code. A switch which is activated by the teeth on the code wheel will cause operation of a tone transmitter which dispatches the code over the connecting channel or microwave system to the receiving equipment at the station.

### THE AUTHOR

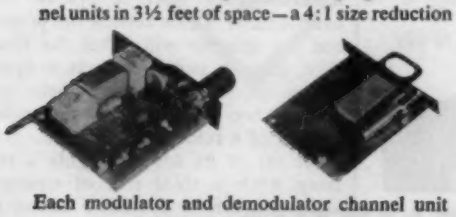
S. M. Hammer, senior engineer, Sinclair Pipe Line Co., entered the communications field a short time prior to 1918 when he joined Kellogg Switchboard & Supply Co., in Chicago. During the 13 years with that company he experimented with circuit designs and the application of carrier frequencies to cable systems which resulted in the first push-button programed radio receiver. In 1932 Hammer joined the predecessor company of Sinclair Pipe Line to design a digital-type tank gage which was superseded by his design of a selsyn-type level gage for application to oil tank gaging. In recent years he has designed wire chief's test boards, supervisory remote-control systems and various telemetering devices. A description of a remote-control device for unattended gathering stations is contained in an article by Hammer in The Oil and Gas Journal, September 20, 1954, p. 250. He was granted a U. S. patent on this device.

# Kellogg Sets New Standards of Reliability in Microwave

**Backed by the world-wide technical, manufacturing, installation and operating experience of ITT**



New MICROPLEX provides 23 plug-in channel units in 3½ feet of space—a 4:1 size reduction



Each modulator and demodulator channel unit features printed circuitry.

Microwave was pioneered by ITT in 1931 with the Channel crossing from Calais to Dover. Today Kellogg Microwave is achieving new levels of reliability: 99.998%, far superior to wire line systems! Operating in dozens of installations throughout the world, Kellogg's *complete* communications package includes:

- *Microwave* – operating in the 2,000 and 10,000 megacycles bands.
- *Terminating Equipment*—for automating functions, including teletype, telemetering, remote control, data transmission.

Part of the Kellogg 10-C Microwave System is the new 10-C-2 "Microplex": a 23 or 45 channel PTM multiplexing equipment. It features printed circuits, miniaturized components, minimum maintenance, and occupies only three-and-one-half feet of rack space. All demodulators are semi-passive—only one tube per channel; modulators are passive—no tubes. The 23 channels use 41 tubes with an input of 180 watts —a 5:1 reduction in power consumption.

MICROPLEX may also be packaged in one seven-foot rack to provide 45 channels; or 23 channels with two-wire termination and tone signaling. Signal cross-talk is 62 db and signal-to-noise (F1A) is 70 db for 23 channels.

Our engineering staff is always at your service—ready to discuss your communications problems. Write for complete details.

Kellogg Switchboard and Supply Company,
6650 S. Cicero Avenue, Chicago 38, Illinois.
Communications Division of International Telephone and Telegraph Corporation.

**Kellogg Offices and Warehouses:**

**CALIFORNIA**
23 Broderick Road
Burlingame, Calif.
OXford 7-5780
TWX SAN MATEO CAL 06

**GEORGIA**
1594 Southland Circle, N.W.
Atlanta 18, Georgia
SYcamore 4-2441
TWX AT 351

**ILLINOIS**
4600 So. Tripp Ave.
Chicago 32, Illinois
CLiffside 4-4300
TWX CG 3296

**KANSAS**
7th & Sunshine Road
Kansas City 15, Kansas
MAyfair 1-4418
TWX KC KAN 1055

**MINNESOTA**
6100 Excelsior Blvd.
Minneapolis 16, Minn.
West 9-6715
TWX MP 1195

**NEW JERSEY**
165 Prospect Street
Passaic, New Jersey
PRescott 9-3610
TWX PAS 1067

**OHIO**
1555 West Fourth Street
Mansfield, Ohio
LAfayette 4-6511
TWX MANS 0 132

**TEXAS**
1515 Turtle Creek Blvd.
Dallas 7, Texas
RIverside 7-5191
TWX DL 02

**EXPORT**—165 Prospect Street, Passaic, New Jersey
PRescott 9-3610, TWX PAS 1067

KELLOGG
CHICAGO, ILLINOIS

A homing switch on another wheel will stop the motor after the contacts on the pressure cell become open.

This can occur only after the pressure has been reduced to a normal value upon correction of the difficulty. Until that time the pulse code will be transmitted continuously. Ordinarily only the first transmission of the complete code in 4 seconds will shut the station down. Its starting circuitry will be wired so as to prevent its being started while the code is being received and then only after the high-pressure difficulty has been corrected.

The equipment might remain idle for a long time before being required to effect a shutdown. Therefore it will be necessary to test the entire control system at regular and frequent intervals to be sure all the components will function properly when called upon to effect a shutdown. A means for testing without shutting down the station has been provided and operates as follows:

A normally open momentary close push switch which is protected from accidental operation by a spring-loaded guard plate or cover is mounted on the front of each of the transmitters alongside the fuse and switch for each unit. Contacts of the test switches are connected parallel with those of the pressure cell.

Before a test switch is operated, the station operator is notified. He will operate a similar test switch which will deactivate the shutdown circuit to the motor to prevent shutdown while testing. A green light will indicate that a test condition exists.

### Receiving or Station Unit

The receiving unit also is effectively a double unit. All components are duplicated to provide two distinct units which can also operate singly or together over their respective channels. Both units are mounted on a single panel which is located on a relay rack, either in an equipment cabinet or on an equipment bay.

The channelizing tone units are also mounted in the same location. A rectifier which supplies direct current of a specified voltage to operate the selectors that respond to the codes and several relays for certain functions is also part of the equipment in the same location. Or it may be an existing supply located elsewhere serving other equipment.

A secondary unit comprising relays and terminals which is associated with a switch and lamp panel is located on a control console. The output circuits of these relays are connected in parallel to an alarm device if provided and to the shutdown circuit of the pump station or pump motor involved.

The panel includes the test switch and associated green lamp. It also contains two red lamps that light to indicated shutdown conditions. There are also two release switches which must be operated to restore equipment to normal and when a startup is permissible.

In the receiving unit proper an alarm relay is permanently operated from the d.c. power supply. If it or its output fuse should fail, the relay will drop out to sound an alarm. The alarm may be local and over the microwave system as well.

### Operation

When the received code pulses actuate the tone receiver, its relay contacts close and open to operate the code selector. If the code is the proper one the selector will, after the final digit, close its switch contacts to operate a relay which then locks up through two of its contacts and under control of a release push button. Another set of its contacts lights a red lamp while a third pair of contacts closes a crash or shutdown circuit to the pump-motor controls which shuts the station down. The other selector

FIND
the HOLIDAY
the SHORT
the PIPE
with TINKER & RASOR'S New
PEARSON-TYPE
Model PD, Detector
Tinker & Rasor have developed a new, compact, highly effective, all transistor, Pearson-type detector. This instrument, the Model PD, produces a 15 watt, 750 cycle audio signal on a buried pipeline. This signal can be clearly heard through a new T & R 4-stage, transistor receiver, small enough to be worn on the operator's belt. Through sharp filters, this new receiver rejects unwanted 60 cycle signals. The receiver weighs but 14 oz. and draws 800 micro amperes from a 4-volt mercury battery. The Model PD detector makes it possible to follow a buried pipe, to locate holidays in that pipe's protective coating as well as any electrical shorting between the pipe and other metal structures.
All components except oscillator storage battery are supplied in a sturdy carrying case.
Oscillator with Interrupter Signal.
Transistorized Receiver worn on operator's belt.
Write For Data
T & R
TINKER & RASOR
417 AGOSTINO RD P O BOX 281 SAN GABRIEL CALIF ATlantic 7-7942
DISTRIBUTORS: Crutcher-Rolfs-Cummings, Inc., Houston, Texas, Remco Manufacturing Co., Inc., Tulsa, Oklahoma, Canadian Equipment Sales and Service, Ltd., Edmonton, Alberta, Bob Herrick, Rentals and Service, Harrisburg, Penna., Falcon Line Products Corp., Elizabeth, New Jersey • Export Agents: Frazar and Hansen, Ltd., San Francisco.

# Is your business moving at 3 miles an hour?

A man walks at about 3 miles an hour.

But his voice travels, via telephone, at the speed of light.

How many people in *your* operation would save time and money by contacting each other at 186,000 miles per second?

Leading oil companies have speeded up operations and pocketed sizable savings with P-A-X — the "inside" business telephone system.

P-A-X is privately owned — entirely independent of public (outside) phone service. It sharply cuts the cost of rented equipment. It's 100% automatic—requires no operator. It gives you "split-second" handling of inside calls—keeps the regular switchboard free for important incoming and outgoing calls.

**Saves man-hours—saves manpower**

P-A-X interconnects all departments with dial telephone service — ends employees' needless effort and wasted time in contacting each other. It prevents tie-ups, speeds the relay of information and instructions.

Get full information on this proved way to step up efficiency and trim costs. Send coupon for case history studies that give facts and figures on installations in major oil companies. Do it now.

**Att.: Manager, P-A-X Sales**
**Automatic Electric Sales Corporation**
**Northlake, Illinois**

☐ *Send me information on Petroleum P-A-X*
☐ *Have your representative call*

Name_____ Title_____

Company_____

Address_____

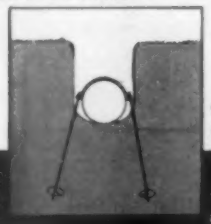
**AUTOMATIC ELECTRIC**

*Check these advantages and you'll install*

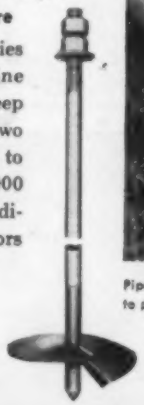
# Chance PIPELINE Anchors

- Costs 85% less
- Easier to install
- Less weight to transport
- Less bulk to store

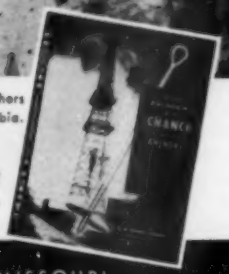
More and more progressive pipeline companies and contractors are turning to Chance Pipeline Anchors to eliminate costly counter weights to keep pipe from floating. A complete unit, consisting of two anchors and pipe saddle bracket, weighs from 29 to 180 pounds and will hold from 5,000 to 30,000 pounds. The anchors can be installed without additional excavation. Light power tools screw the anchors down in seconds.



Cut away view of anchors and bracket installed in trench.



Pipeline crew installing Chance Pipeline Anchors to prevent floatation problems in British Columbia.



*Write for complete catalog and application information.*

ABC INDUSTRIES

**A·B·CHANCE CO.** CENTRALIA, MISSOURI
TORONTO, ONTARIO, CANADA

---

## MAVOR-KELLY CO.

*the products you need*

BITUMASTIC
HOT & COLD APPLIED COATINGS

TAPECOAT
PIPE JOINT PROTECTION

Carey
PIPELINE FELT, PADDING & GLASS PIPE WRAP

WILBUR & WILLIAMS

TOTRUST

PERMAGILE

*and the service you deserve*

M & M BLDG., HOUSTON, CA 2-2203

1038 4th St., Gretna, La. FOrest 1-1861

INDUSTRIAL CORROSION PREVENTION

---

**NEW AND POWERFUL CENCO® MAGNETIC STIRRER**

LOW PRICED AT **$29.50**

For the first time, a really low price *variable speed* magnetic stirrer . . . powerful enough to stir a beaker of pure glycerin

ORDER TODAY.

the most complete line of scientific instruments and laboratory supplies in the world.

cenco®

**CENTRAL SCIENTIFIC CO.**
1724 Irving Park Road • Chicago 13, Illinois
Branches and Warehouses — Mountainside, N. J. Boston • Birmingham • Santa Clara • Los Angeles • Tulsa Houston • Toronto • Montreal • Vancouver • Ottawa

A NEW Gaslite

INCORPORATING THE MOST ADVANCED FEATURES AND DESIGNS IN DECORATIVE

Outdoor Lighting

LOOK FOR THE NAME

Gaslite BY ARKLA

for information write:
ARKLA AIR CONDITIONING CORP.
SALES OFFICES: LITTLE ROCK, ARK.



THE SIGN OF INTEGRITY

O. R. BURDEN

CONSTRUCTION CORPORATION

GENERAL PIPELINE CONSTRUCTION

TULSA, OKLAHOMA

O. R. BURDEN, President
P. T. THIBODAUX, Vice-President
J. S. BURDEN, Vice-President

P. O. BOX 5216 — PHONE TE 8-3374


unit will respond in like manner and light a second red lamp. The contacts for the crash circuit of both units are multiplied so that either or both units can effect shutdown.

After a selector has completed effective selection, it is automatically restored by an extra last pulse after the train of code pulses. Since the pulse code is continuously transmitted from the sender associated with the high-pressure cell, the selector continues to respond to maintain shutdown response. Thus only after selection has ceased can the operation of the release button permit the station to be restarted.

The selector used is of a design which causes it to lock out on receipt of an improper code. An improper code could result from either improper code generation at the transmitter unit, the channelizing equipment, or improper operation of the selector circuitry. When in an idle condition, extraneous pulses due to malfunctions in the channelizing equipment can also lock out the selector. In either case the selector must be restored to normal before it can be reoperated properly.

This is accomplished by the use of an extra relay and by a pair of motor-driven cams and switches in the receiver or control unit. Operation is as follows:

The pulsing which actuates the selector also operates a slow to release relay which causes a 1 r.p.m. motor to start. A homing switch on one of the cams keeps the motor running for 1 minute. Just before the motor stops, which will be 1 minute after pulsing ceases, a switch on a second cam will momentarily close its contacts to generate a single restoring pulse to restore the selector.

Therefore, in any event, the selector is always ready to respond to pulses, whether they are false or whether they are genuine.

### Reset

When conditions permit restarting, the release switches on the console are operated to extinguish the red lamps and to open the crash or shutdown circuitry. Testing of any kind is performed only after a test switch is operated which lights a green lamp and deactivates the crash or shutdown circuit.

The picture of the transmitter panel shows the dual code-generating wheels which were made of plastic and the dual set of relays, switches, and lamps. The receiver panel shows the dual selectors, relays, lamps, switches, and motor-driven cam wheels. Both units are provided with dustproof covers which are not shown.


STOPS BREAKS ON TANK MOVEMENTS

PENFLEX TUBING

ADDS LEAKPROOF FLEXIBILITY TO RIGID TANK LINES

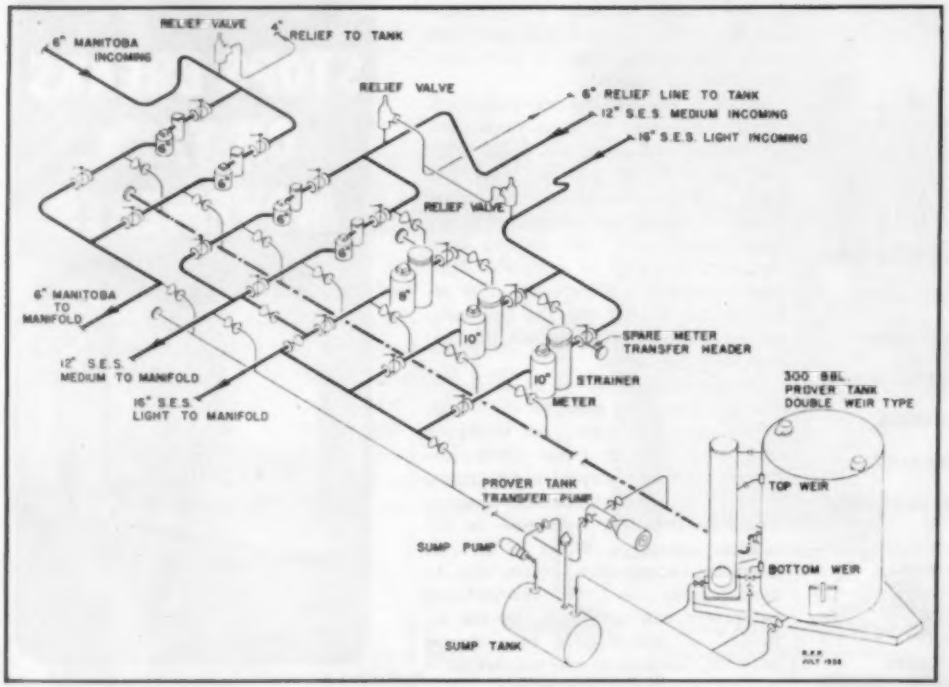
Moving slowly with expansion, contraction and settling of storage tanks or riding out the tide in unloading tankers, Penflex Tubing has proved its flexibility. It "gives" with temperature changes and settling without breaking . . . withstands crushing, abrasion, exposure . . . yet it stays as tight as a pipe, prevents dangerous leaks and seepage.

Whatever your tubing needs—for oil field, refinery, bulk plant, transportation equipment—let Penflex meet them with *flexible*, corrugated or interlocked tubing available in bronze, galvanized or stainless steel tubing in sizes from 1/8" to 24" I.D. For full data write Pennsylvania Flexible Metallic Tubing Company, Inc., 7213 Powers Lane, Phila. 42.

GET YOUR COPY of this practical, helpful guide to flexible tubing.

PENFLEX

TIGHT AS A PIPE BUT... FLEXIBLE




## This layout at Interprovincial's Cromer station is another boost for . . .

# Positive-displacement metering

BY R. B. CANNING
Interprovincial Pipe Line Co.

AS A PART of its continuous program of expansion and improvement, Interprovincial Pipe Line Co. is installing a positive-displacement metering system for the custody transfer of crude oil at its pump station near Cromer, Man. It will free gaging tanks for floating-tank service and thus slow down the ever-increasing demand for more tankage.

Due to fast-rising tankage requirements and the fact that only three streams were being received at this station, it seemed the logical location for our initial custody-transfer metering system.

Cromer pump station contains four 900-hp. diesel-driven single-stage units on the original 16-in. line and four 2,040-hp. diesel-driven five-stage pumping units handling crude flow through a 24-in. line. The tank farm contains approximately 750,000 bbl. of gaging and floating-tank storage capacity as well as a manifold and blending system designed to handle a variety of crude-blending requirements.

Crudes from three different oil fields are received at Cromer: Manitoba crude, Southeast Saskatchewan light crude, and Southeast Saskatchewan medium crude.

In addition, pure and blended crudes from Alberta and Regina, Sask., are received into floating tankage at Cromer from the two incoming Interprovincial lines in preparation for batching and further blending with the Southeast Saskatchewan and Manitoba crudes, With the installation of positive-displacement meters, the three incoming field crudes can be directed to floating tankage or blended with the Alberta blends for continuous flow through the pump station to points east.

With the extremes of temperatures realized in this part of the country (winter temperatures as low as −40° F.), it was necessary to provide facilities for low-temperature operations. Foundations will be extended below frost level and facilities provided to retard wax buildup on the prover tank walls.

### Manifold and Meters

The manifold foundation is located more than 6 ft. below ground elevation and consists of a one-piece network supporting the individual pedestals upon which the above ground manifold piping rests.

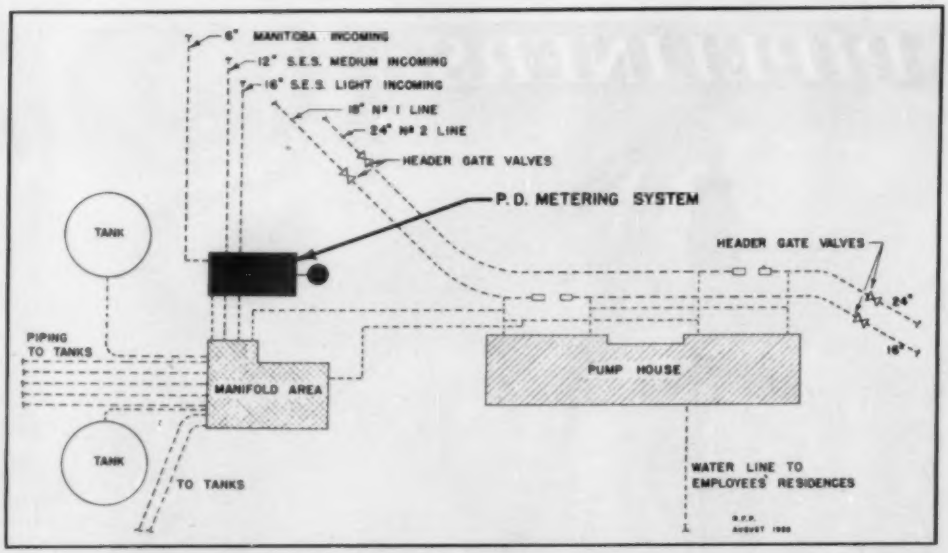
Each of the three incoming lines is provided with two meters. One 6-in. meter will handle present rates on the Manitoba crude line. A second 6-in. meter provides standby capacity for this line. Two 6-in. meters are pro-

THE AUTHOR

R. B. Canning is a member of the head office engineering staff of Interprovincial Pipe Line Co. He attended the University of Toronto in mechanical engineering and graduated from the California State Polytechnic College with a B.S. in mechanical engineering in 1949.

After 4 years with Canadian Ice Machine Co. as sales engineer and Ontario division project engineer he joined Interprovincial in December 1953.

**PUMP HOUSE** and manifold area at Interprovincial's Cromer station.




vided for the Saskatchewan medium crude and two 10-in. meters for the Saskatchewan light crude. An 8-in. meter is arranged to operate as a spare for either the Saskatchewan light or Saskatchewan medium line.

The whole installation is arranged so that if rates should exceed forecasts, its expansion will require a relatively low capital investment.

Since the proving tank is in reality a part of the metering system, it is unnecessary to provide a master meter for proving. With dual meters on each line a portion of the flow can be used to prove one meter without interrupting the stream to tankage. This will of course reduce the rate to tankage but this reduced rate will have no adverse effects. Proving will be accomplished by running the meter to be proved in series with the prover tank by directing the flow through the meter and then through the underground manifold header to the prover tank.

Flow switching will be accomplished quickly through the use of butterfly type switching valves. These will be located on the downstream side of each meter and in the prover-tank fill line adjacent to the tank. The arrangement of dual meters on each line and the 8-in. spare meter is expected to handle present rates as well as foreseeable future rates.

### Counters and Printers

Ticket-printing facilities for custody transfer will be located in the control room of the pump station where three dual-head counter printers will register the barrels received through a system of selsyn transmitters and receivers. The selsyn transmitters are located at the manifold and will transmit a continuous signal of barrels received.

The meter flow signal is mechanically transferred to the selsyn transmitter by means of a system of combinators actuated through rigid drive shafts tied into the meters on each line. The spare meter can be tied into the combinating system for either the East Saskatchewan light or East Saskatchewan medium line by means of dual shafts with slip fit bayonet end connections. A large numeral counter will be located on top of each meter to be used during proving operations.

### Prover Tank

The proving tank will be a standard 300-bbl. double-weir type tied to a graduated stand pipe. The tank foundation will consist of three concrete piers extending approximately 6 ft. below ground level. The tank and stand pipe will be supported on a structural steel base which in turn will be supported at three jacking points, one on each of the concrete piers. This will permit accurate leveling of the tank.

The tank will be coated on the inside with an epoxy resin to minimize wax buildup on the tank walls during cold-weather operations. The tank will be insulated on the outside with approximately 2-in. of glass fiber covered with weatherproof resin. This external insulation is being provided in an attempt to reduce the temperature gradient through the tank wall during winter proving periods.

A solvent-injection system will also be provided to dissolve wax coatings from the inside of the tank. It is expected the inside coating and outside insulation will reduce the rate of wax buildup in the winter and eliminate waxing problems in other seasons. However, the injection equipment may be necessary during some periods of winter.

The main body of oil in the prover tank will be transferred to one of the three lines downstream of the meters through a high-capacity tank booster pump until the crude level approaches the bottom weir. The final volume of crude will be allowed to drain into a sump tank which will be emptied periodically by means of a sump pump.

Automatic samplers will be located on each of the three lines downstream from the meter manifold and will be used for quality control when crudes are pumped directly into an outgoing batch. B.s. and w. monitors will detect high b.s. and w. and operate an alarm signal in the pumphouse control room.

The meters and manifold system were designed for 150-psi. service. Full-flow relief valves are provided to protect the meter and manifold system against excessive line pressures. In addition to this, an alarm signal actuated through pressure switches will warn operators in the pump station when pressures approach the relief-valve settings.

### Economics

It is apparent that the major economic advantage to be gained by the use of positive-displacement meters in this type of system is through the reduction in capital expenditure for tankage. While the efficiency of operations is expected to improve, there will be no direct savings in manpower. Future expansion of this and other systems may eliminate the need for additional gaging crews but in their place will require skilled technicians to handle meter maintenance and calibration.

PHOTOGRAPH FROM EL PASO NATURAL GAS 30" PIPELINE JOB, GRANTS, NEW MEXICO, AUGUST, 1958

**WATER-FLUSHING** run following heavy mechanical cleaning of a 4-in. high-pressure salt-water line.

# Internal in-place pipeline cleaning

## . . . preparatory to coating. "The cleaner the surface, the better the coating protection"

BY FREDERICK F. TRACY
Internal Pipeline Maintenance Co.

THE COATINGS INDUSTRY composed of the manufacturer, formulator, and contractor, is in agreement upon one particular axiom, and that is: "Given any specific coating material, the cleaner the metal surface to which it is applied, the more enduring will be the protection provided by the coating to that surface."

Also, over many years of trade experience, chemical cleaning in the plant and sandblasting in the field have been accepted as providing an adequately clean surface for a long-lived coating application. To achieve this standard of cleanliness has been the goal of the internal, in-place, pipeline-cleaning-and-coating service contractor.

### The Problem and Early Methods

The first step in the solution of the in-place cleaning problem was identification of the internal contaminants on a qualitative basis; however, their lack of homogeneity throughout the length of pipe and throughout the thickness of their actual deposit upon the pipe wall made any quantitative determination impossible.

Consequently, precise chemical removal of these contaminants was impractical. The early developers were thus forced to mechanical means of removal. Various brushes, wire scratchers, pipeline pigs, and other devices, were rapidly driven through the entire length of line to cut, scrape, and chew up the contaminants adhering to the pipe wall.

The internal, in-place, pipe cleaner, however, enjoyed one advantage over the structural-steel sandblaster, because of being within the confines of the pipeline. He could expose these contaminants to various chemicals and solvents which he could propel through the line by individual batches, or by completely filling the line.

However, he could not control these chemicals and solvents throughout the line, either as to potency or contact time, nor could he be confident that any given chemical would work equally well on the differing scales and sections of pipe.

The other great disadvantage under which the specialist in the in-place field labored was that the bulk of contaminants in an old pipeline was by weight and volume far in excess of the contaminants found in any industrial-cleaning problem. And in addition to this, the actual great weight of contaminants, when removed from the pipe wall, had still to be taken out of the line at only two places; that is, the two open ends.

### Analysis of Contaminants

A qualitative determination of the contaminants in new steel pipe (not yet in service) furnishes us with three general categories:

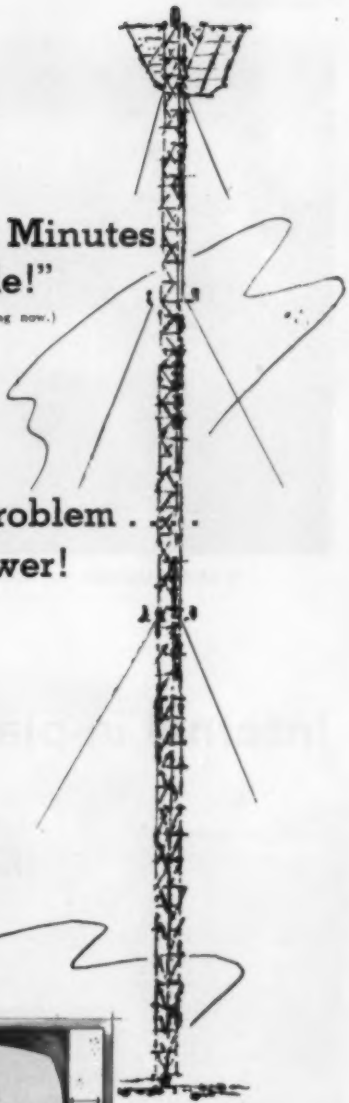
1. **Mill scales.**
2. **Mill lacquers.**
3. **Corrosion products** resulting from atmospheric exposure.

Similarly, a qualitative determination of the contaminants in an old pipeline which has been in either crude-oil, petroleum-products, natural-gas, potable or salt-water service furnishes us with five categories of contaminants. All of these contaminants may not be present in any specific line, but some of the following will

"Erect a Tower for 15 Minutes rental? . . . . . Incredible!"

(Ed. note: Mrs. Wright's boy, Charlie, had heard everything now.)

"When do we start?"



# WIDE WIDE WORLD had a problem . . . .

## . . . . and TOWER provided the answer!

**TOWER CONSTRUCTION CO. picked up a challenge and delivered the impossible . . . a 200' microwave tower and reflectors, completely installed and ready to go in TEN DAYS for the premiere program of the popular NBC series, "WIDE, WIDE WORLD." Again, TOWER drew upon its most valuable asset . . . experienced "know-how" . . . and came up with a workable tower rental plan designed to make "remotes" from inaccessible locations both feasible and economical. "WIDE, WIDE WORLD" was made wider through TOWER'S ability to handle the unusual.**

**TOWER'S Rental Service Plan is tailored to fit the demands of the petroleum industry. Ask the folks at TOWER to show you how they can put you "on-the-air" without tying up vital working capital.**

TOWER

Phone us today for all the facts!

CONSTRUCTION CO

2705 Hawkeye Drive Phone: 5-7653

SIOUX CITY, IOWA

**MAIL COUPON FOR FREE 92-PAGE BOOK on Microwave Towers — Reflectors — Buildings — Special Towers; and Rental Service Plan information!**

TOWER CONSTRUCTION CO.
2705 Hawkeye Drive, Sioux City, Iowa

Name: _____

Firm: _____

Address: _____

City: _____ State: _____

**In fact, TOWER answered time and time again for such well-remembered "remotes" by WIDE, WIDE WORLD as:**

LOS ALAMOS, N. M.—"Atom Bomb Site"
CARLSBAD CAVERNS, N. M.
GRAND CANYON, COLO.
TOMBSTONE, ARIZ.—"Tombstone Today"
ABILENE, KAN.—"Eisenhower's Birthplace"
CYPRESS GARDENS, FLA.—"Florida Vacation"
VALLEY FORGE, PA.—"400th Anniversary"
NATCHEZ, MISS.—"Easter in The Old South"
WHITE SULPHUR SPRINGS, W. VA.—"Greenbriar"

**and many more for this and other programs around the nation.**

**AN EARLY** mechanical cleaning run through a 6-in. gas-supply line.

**FULL-STRENGTH** phosphoric acid being introduced into a 20-in. gas line. Dilution of the acid and addition of wetting agents is done in the loading barrel prior to running the acid mixture in the line.

be present, in varying combinations, in any pipeline:

1. **Paraffinic and asphaltic** deposits, oil residues.
2. **Hydrogen sulfide.**
3. **Oxides of iron.**
4. **Mineral scales** such as the sulfates, carbonates, and chlorides.
5. **Corrosion stimulators.**

These contaminants may be combined into loose, bulky scales or tight compact scales, and both types may be either poorly or tightly bonded to the pipe wall.

The oily residues, paraffins, etc., can be removed from a pipe by petroleum solvents. However, this method is slow and, consequently, expensive. A further disadvantage is that the lower order of solvents themselves deposit a slight oily film on the pipe wall which in turn has to be removed by higher-order solvents.

### Remaining Crude Residues and Mineral Scales

An investigation was made of various alkaline degreasers in an attempt to discover an economic method of removing these crude residues. These caustics were quite effective in removing the residues but, in their turn, they also left a film on the pipe wall which defied reasonable and economically feasible removal.

The particular problem was finally resolved through the development of a family of special detergents, embodying emulsifying and wetting agents, which were usable in petroleum solvents and potable water. This particular system reduces the crude residues to a water-soluble condition. The contaminants can be readily removed from the line by water flushes, and their removal leaves no oily or caustic film.

These crude residues provide much of the binder material which builds the mineral scales into a tight layer of nonhomogenous contaminants. A great deal of the mineral scale will be removed by the mechanical abrasion used in conjunction with the crude-residue-removal procedures. The remaining scales can then be more effectively attacked by further strenuous mechanical scraping.

After the removal of the mineral scales, the line will be clean and completely water wet. It is then dried by batching through the line, by means of dehydrated air, various alcohols, acetones, and ketones. The clean and dry line is then ready for the application of a plastic coating.

### Corrosion Stimulators and "Tooth"

Our engineering staff felt that although the surface so far discussed was clean to the eye and had given an excellent account of itself in actual service, it lacked two qualities essen-


**THE AUTHOR**

Frederick F. (Ding) Tracy is technical representative for Internal Pipeline Maintenance Co., Odessa, Tex. He is a 1941 graduate of University of Maine, with a degree in mechanical engineering. He did aircraft-engine testing for the Airforce at Wright field before and after World War II, in which he served as a lieutenant (j.g.) on a subchaser. In 1948 he became associated with Gulf Oil Corp. as petroleum engineer, and joined his present company 8 years later.

**INSPECTION** of the line to determine degree of cleaniness.

tial to optimum coating life. First, it was doubtful that the corrosion stimulators (invisible particles of the salts of mineral and some organic acids) had been removed; and second, the pipe surface did not have the quality known as "tooth."

Both these much-sought-after conditions are obtained in the factory by acid etching baths, while only tooth is obtained by sandblasting. Therefore, our engineers investigated the various acids available for this work in industry. Over many years, industry had developed various phosphoric acid formulations which destroyed the corrosion stimulators and etched a tooth into the metal surface. Here, however, their use in a pipeline was more difficult, as the acids could not be used hot and their time of contact with the pipe wall was limited.

Repeated laboratory and field experiments have developed special techniques and a formulation using phosphoric acid as a base. Incorporated into the acid were certain wetting and special agents which overcame the two principal difficulties to the use of acid in in-place work. A supplementary benefit to the use of a phosphoric acid is that the acid will also remove light corrosion products.

Thus, by the use of the above-described methods, it is possible to obtain a chemically clean, neutral metal surface with an adequate tooth; in short, the optimum conditions is obtained inside the pipeline that is also obtained in the closely controlled environment of the modern factory.

In a few old lines thick mineral scales are particularly hard and dense, well bonded to the pipe wall, and held together not by petroleum residues but by other mineral scales. In such cases even the hardest mechanical scraping, combined with detergents and phosphating acids, could not produce a clean line at anything like an economically acceptable price. Other quicker, cheaper methods had to be developed for these lines if the benefits of cleaning and coating were to be realized.

Various sections of pipe containing different types of these hard, dense scales were submitted to extensive laboratory examination and then subjected to various feasible reagents. From these tests, it was determined that it would be too expensive to attempt to dissolve these deposits in toto, but that it might be possible to break down a chemically weak link in the deposit. This would loosen the deposit's bond to the pipe and its cohesion to itself and thus make these scales more vulnerable to mechanical abrasion.

As a result of further intensive laboratory and field tests, a muriatic acid containing wetting, sequestering, and inhibiting agents, plus some special solvents, was developed. When used in conjunction with mechanical abrasion, it destroyed the scale-binder material, loosened its bonds, and allowed the mechanical action to scrape it from the pipe wall.

### Testing for Cleanliness

The first methods used by company inspectors and our superintendents to determine the degree of cleanliness of the pipe wall was by visually and tactually inspecting various samples of pipe cut at random from the clean line. If contaminants could not be seen or felt on these samples, the sample was pronounced clean. These spot checks were then assumed to be representative of the entire line. This reasoning is not as specious as it may seem. Samples can be selected from those sections of the pipeline which the geographic parameters of the pipeline indicate will be the most difficult to clean. For example, the sags and bends in a sour-crude line and overbends in a water line contaminated by carbon dioxide will be the most deteriorated sections of the entire line. As a result, these sections will be

**no problem on a Sheehan spread!**

. . . like a chameleon, SHEEHAN adapts to the environment.

Whether a spread is strung over flat farm lands or crowded into a congested city has little effect on SHEEHAN'S efficiency and speed of operation. With a versatile staff of qualified personnel and a wide selection of modern equipment, SHEEHAN can easily adjust to existing right-of-way conditions.

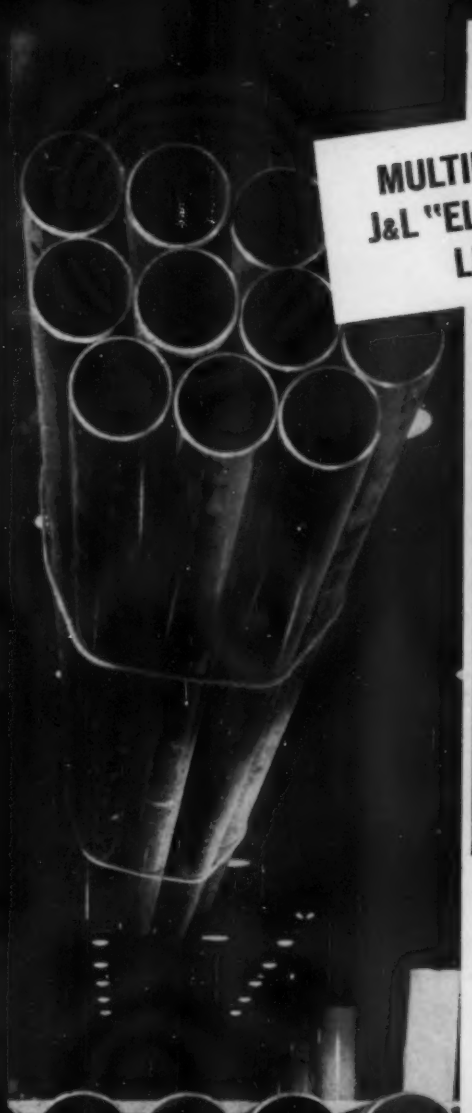
Whether your next line is laid *mile by mile* or *block by block*, it will be successful if it's built by SHEEHAN.

**Let Sheehan's experience work for you on your next pipe line project.**

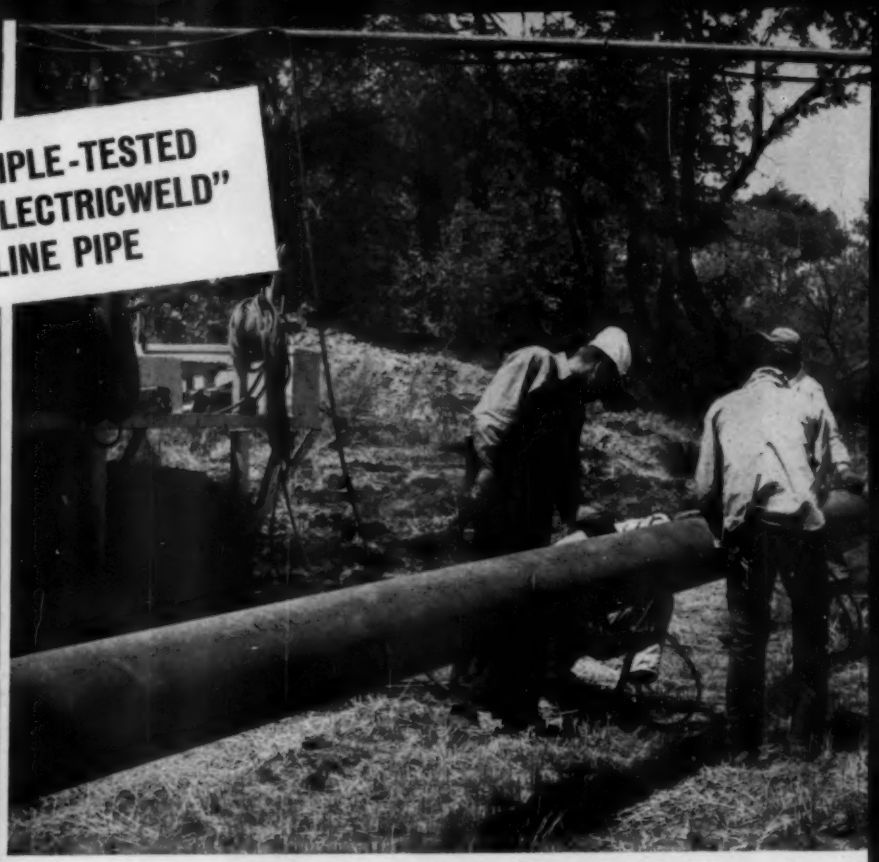
SHEEHAN PIPE LINE CONSTRUCTION CO. TULSA OKLA

**SHEEHAN**

NATIONAL BANK OF TULSA BUILDING
TULSA, OKLAHOMA



**MULTIPLE-TESTED J&L "ELECTRICWELD" LINE PIPE**



Welders on this Jayhawk Pipe Line Company installation report J&L Electricweld pipe is easy to weld. They installed 3109 tons of 10¾-inch O.D. and 3172 tons of 12¾-inch O.D. Electricweld pipe in this line. Both sizes are in .250 inch wall and Grade X46.

# Jayhawk relies on J&L "Electricweld" line pipe for 78 miles of dependable performance

The Jayhawk Pipe Line Company, Wichita, used 42 miles of 10" and 36 miles of 12" J&L Electricweld line pipe in this new line from Plains to Valley Center, in Kansas. They find that J&L Electricweld line pipe bends readily, is uniformly round, is consistently top quality.

Electricweld line pipe is produced by Jones & Laughlin under most rigid quality controls. J&L, an integrated steel company, is able to control quality from ore through finished pipe. J&L takes every step to assure unsurpassed quality and dependability in Electricweld.

Before welding, the skelp edges are blasted with steel grit under 100 psi in a "Vacu-Blast" unit to clean the surface for perfect contact with the welding electrode. Electronic controls maintain exact welding heats at all speeds. After welding and trimming, the pipe passes through an induction annealing unit to assure uniform grain structure in the weld area.

Every length is thoroughly inspected through visual examinations, hydrostatic tests, flattening tests and magnaflux examinations. All J&L Electricweld line pipe is manufactured and tested in strict compliance with appropriate A.P.I. and A.S.T.M. specifications.

Electricweld line pipe is available from 6⅝ inches through 12¾ inches and in lengths to 60 feet. Investigate this superior-quality pipe for your next line. See your distributor, or write to Jones & Laughlin Steel Corporation, 3 Gateway Center, Pittsburgh 30, Pa.

J&L STEEL

## Jones & Laughlin Steel Corporation

PITTSBURGH, PENNSYLVANIA

the most troublesome to clean well.

Our engineers, working in cooperation with a research staff of a major company, have devised a more rigorous method of testing the internal cleanliness of a pipeline.

This method prescribes that a batch of volatile petroleum solvent, such as stoddard solvent, be run through the length of clean pipeline in column between two rubber bell plugs. By empirical means, the optimum amount of solvent and velocity of travel have been determined for various diameters and lengths of pipe.

Small samples of solvent are extracted from the bulk solvent prior to its being pumped into the pipeline. Additional samples are extracted from the column of solvent after it has traversed the length of the line.

These samples are then tested in the laboratory under procedures outlined in ASTM Standard D381 and D130, Maximium 1. Thus against arbitrary, established standards, it is possible to determine if the solvent has picked up any corrosive matter, crude residues, or any other foreign matter affecting its color as it passed through the line. If it has not, the line is pronounced clean. All that remains, if the line is to be coated, is the routine removal of the testing materials.

## Frame helps support pipe ends

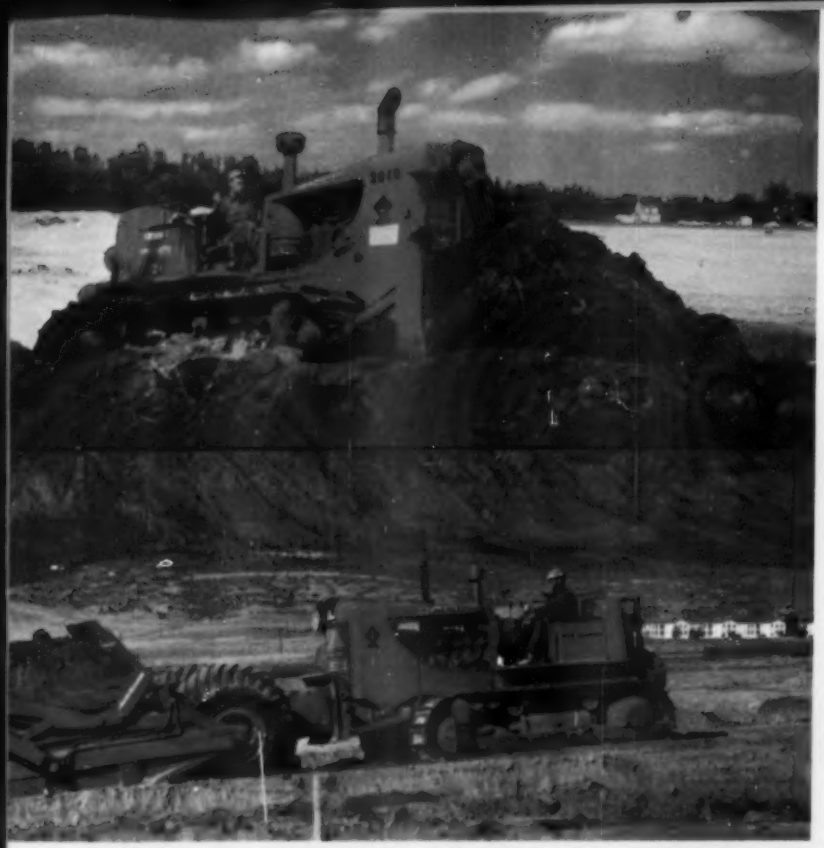
WHERE an oil-field truck is used for many purposes, a support for the front of the joints of pipe may be made so that the pipe can be hauled on either side of the cab.

This allows the left side of the truck to be clear unless it is necessary to handle pipe from that side when stringing pipe. When not in use, the pipe frame can be slipped entirely out of its socket and carried in the tool box of the truck.

The support is made by welding a piece of 2½-in. pipe into the center of the grill guard on the truck and a short piece of 1½-in. pipe on each corner. The frame is then made up as shown out of 2-in. pipe.

When in use, it is thrust down into the center well.

Grayco
CONSTRUCTORS Inc. AUSTIN TEXAS
1201B WEST 34th STREET Phone: HOmestead 5-8797
Gas — Oil — Products — Water
PIPELINE CONSTRUCTION
Jack S. Gray, President
Robert L. Morrison, Vice-President
Leonard W. Clare, Secretary-Treasurer
Emmett E. Wilkerson, Superintendent



## Look ahead
## ...*move ahead*
## ...and stay ahead
## with
## Allis-Chalmers
## crawler tractors

# first choice on more and more tough jobs

Four big advantages stand out in the coast-to-coast swing to Allis-Chalmers crawler tractors:

- **outstanding work capacity**
- **real dependability under severe conditions**
- **easy maintenance and lubrication**
- **timesaving, cost-cutting service**

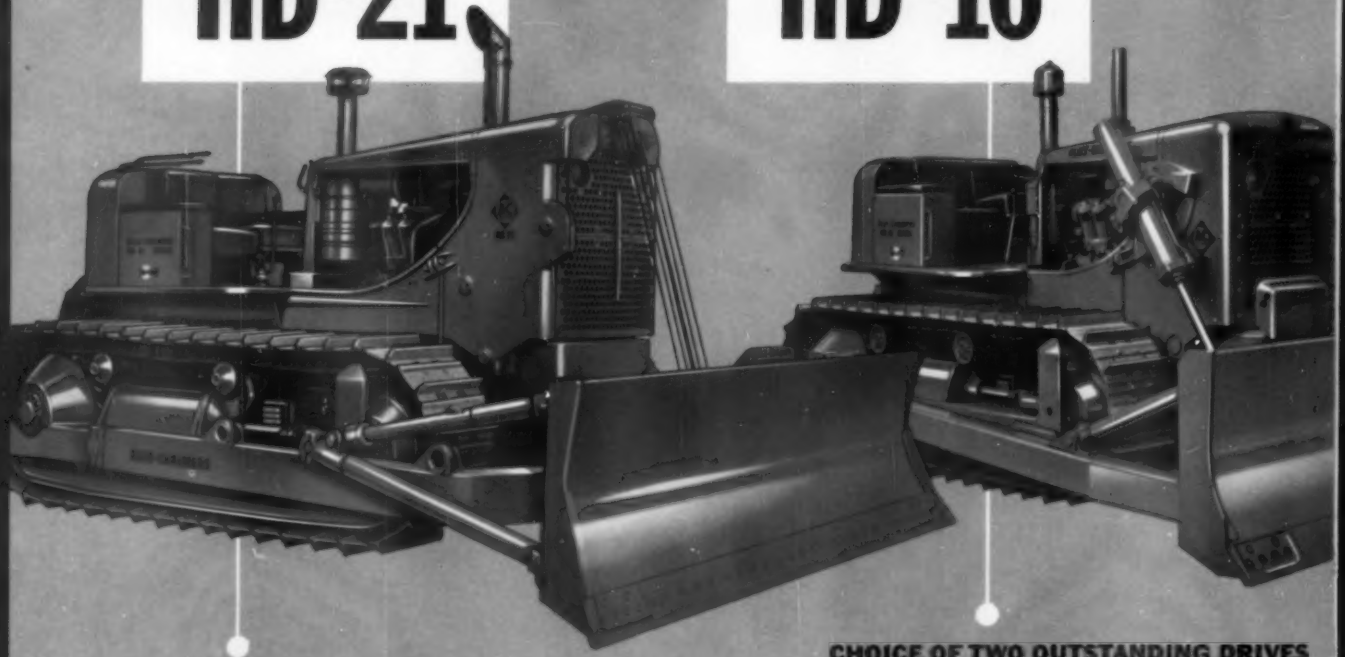
As a result, Allis-Chalmers users bid closer to the belt, set schedules with more confidence, end up "in the black." So before you buy your next tractor, take a close look at *these* machines . . .

# There's an extra measure of

## IN EVERY SIZE

ALLIS-CHALMERS
**HD-21**

ALLIS-CHALMERS
**HD-16**



225-hp turbocharged engine
Hydraulic torque converter drive
56,260 lb (approx. as shown)

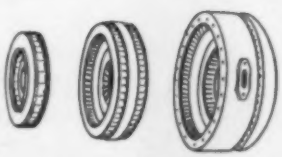
The new HD-21 brings you live power for today's big-tractor jobs—and torque converter drive puts it to work automatically. The HD-21 offers more work capacity—dollar for dollar—than any other big crawler tractor you can buy.
*HD-21A illustrated—Two other models available*

**CHOICE OF TWO OUTSTANDING DRIVES**

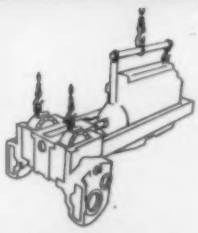
| Hydraulic torque converter | All-gear |
|---|---|
| 150 net engine hp | 141 belt hp |
| 39,080 lb (approx. as shown) | 125 drawbar hp |

Get up on the HD-16 yourself—and see how it handles jobs ordinarily assigned only to bigger, more expensive crawler tractors. You'll sell yourself—just as more keen-eyed construction men do every day.
*HD-16DC illustrated—Five other models available*

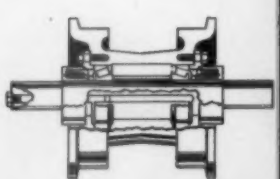
## Pioneered and proved by Allis-Chalmers Engineering in Action



**Torque Converter Drive** gets more work done—automatically provides the right pull or push for every load, at maximum speed for existing conditions. *(Available in HD-21 and HD-16 only.)*



**Unit Construction** saves valuable time . . . lets you remove any major assembly without disturbing adjacent assemblies.



**1,000-Hour Lubrication** intervals for truck wheels, idlers, support rollers . . . changes daily greasing time into production time.

## THE ONLY COMPLETE LINE OF CRAWLER TRACTORS THAT

# performance and dependability

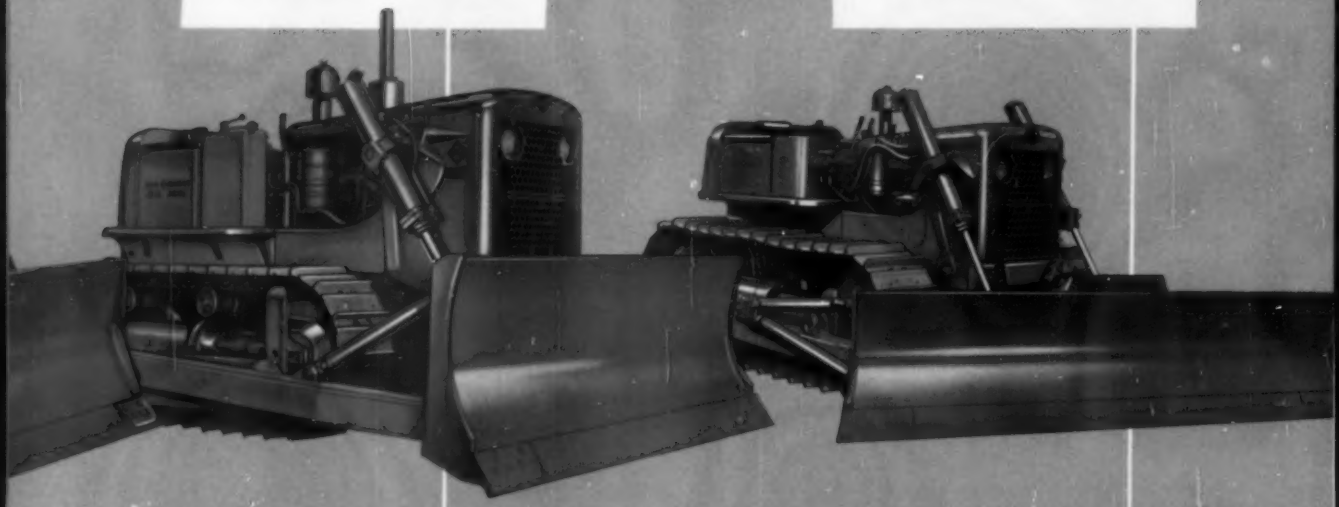
## . A SIZE FOR EVERY JOB

ALLIS-CHALMERS

## HD-11

ALLIS-CHALMERS

## HD-6



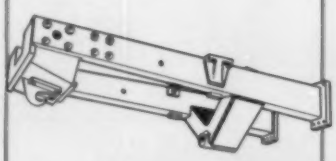
**94 belt hp**
**25,960 lb (approx. as shown)**

**The HD-11 is setting new standards in its size range . . . offers you dozens of work-boosting advantages, including the industry's easiest shift pattern. A single shift takes it from any forward speed to any reverse—gets short-cycle jobs done faster, easier.**
***HD-11B illustrated—Two other models available***

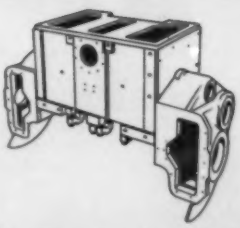
**63 belt hp**
**16,470 lb (approx. as shown)**

**Here's up to 15,500 lb drawbar pull. The HD-6 is the only tractor near its size with big-tractor design advantages—for example, All-Steel Box-A main frame and engine-mounted dozer with direct-lift cylinders for improved weight distribution, accurate dozing and long life.**
***HD-6E illustrated—Three other models available***

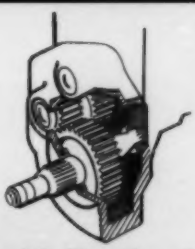
**True-Dimension Track** heat-treated and machined in the industry's most modern facilities, is setting new track-life records on every type of work.



**All-Steel Box-A Main Frame** soaks up shock and strain . . . provides improved weight distribution and equipment mounting.



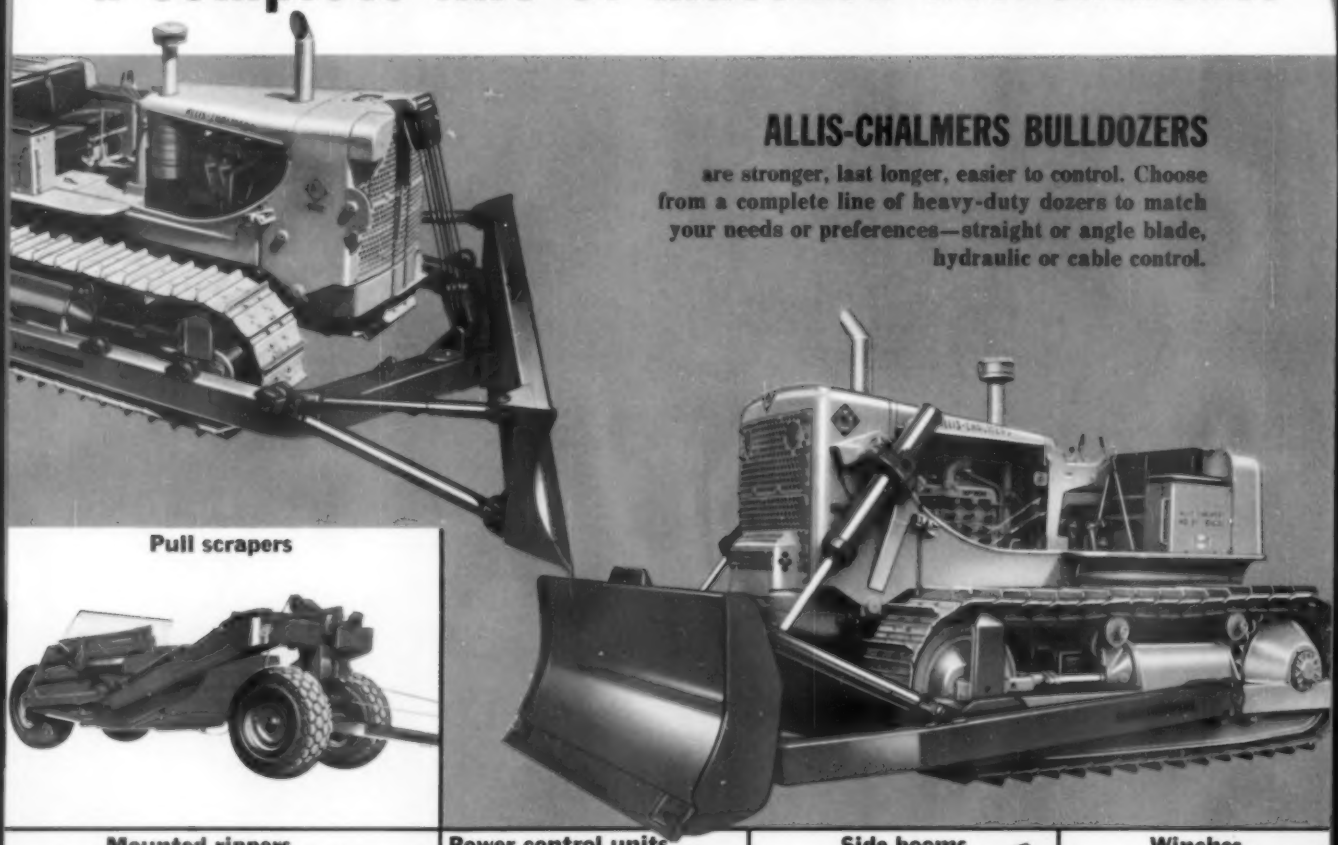
**One-Piece Steering Clutch and Final Drive Housing** with extreme rigidity and strength . . . line-bored to provide precise alignment of gears and shafts.



**Straddle Mounting of All Final Drive Gears** with tapered roller bearings on both sides of short, large-diameter shafts . . . provides extra gear life.

## GIVES YOU ALL THESE ADVANTAGES IN EVERY SIZE..PLUS

# a complete line of matched attachments



## ALLIS-CHALMERS BULLDOZERS

are stronger, last longer, easier to control. Choose from a complete line of heavy-duty dozers to match your needs or preferences—straight or angle blade, hydraulic or cable control.

**Pull scrapers**



**Mounted rippers**

**Power control units**

**Side booms**

**Winches**

**A demonstration on your job will prove their value . . . call your Allis-Chalmers dealer now.**

# Look ahead...*move ahead*...and stay ahead

ALLIS-CHALMERS, CONSTRUCTION MACHINERY DIVISION, MILWAUKEE 1, WISCONSIN

**ALLIS-CHALMERS**

FORM MS-1303

LITHO. IN U.S.A.

## An innovation by Northern Natural helps lick the problem of

# Erosion control and backfill repair

BY HAROLD J. AVERETT
Northern Natural Gas Co.

EROSION CONTROL and backfill repair present a considerable problem in areas having rich topsoil, hilly terrain, and heavy rainfall. This is especially true in Southwest Iowa where the author and his associates have conducted experimental work. This part of Iowa has a "sugar clay" soil which tends to dissolve and wash during heavy rains.

Extensive washing and undermining are often started by water rushing down an incline or draining into a rodent hole or crevice, dissolving the sugar clay and sometimes penetrating to the pipeline or deeper. On a hillside, once it has penetrated to the line, water may flow and wash along the pipe for considerable distances, creating voids with all their implications.

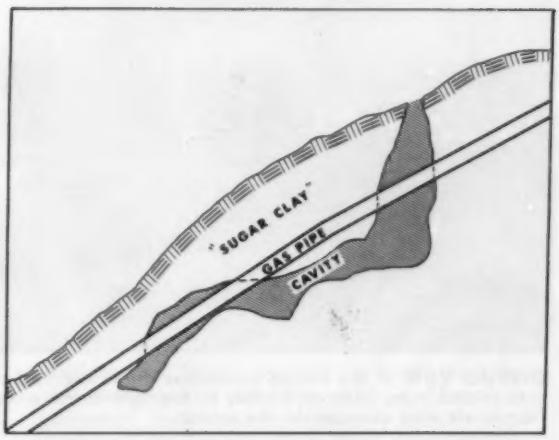
We have experimented with several methods of repairing and controlling soil erosion and underground washing and have developed several techniques which are proving very successful.

### Below-Surface Backfill Repair

For years we repaired undermined areas with dozer and back-hoe equipment, by excavating and installing sack breakers and backfill. This type of repair did extensive damage to topsoil and crops which displeased landowners and tenants and was expensive.

We started exploring for a better method of repair when it became evident that loose soil placed in backfill holes will settle beneath the compacted surface, leaving a cavity underneath. These underground cavities and crevices have been so extensive that livestock and farm equipment have actually dropped into them. This condition is not visible and on the surface the soil looks stable.

The procedures we have developed for repairing underground voids in backfills may be referred to as the "mud backfill process." This process has greatly reduced damage to topsoil and crops. It does not require extensive excavation.




**CROSS - SECTION** of slope where water has washed out a cavity, undermining the pipe.

Earth for mud mixing may be obtained from non-crop-growing areas and ground scuffing is nil due to absence of heavy tracked equipment. This type of repair will last indefinitely as compared with the dry-dirt backfill method which had to be repeated two to three times over a period of 3 to 4 years.

This method requires very little equipment and few personnel: a mechanical plaster mixer, a water tank, an air compressor, a small wheeled tractor with loading device, suitable transportation equipment, and four to six men. When soil for mud mixing is not available on the right-of-way, landowners will very often allow removal of back furrow dirt in the fence row. It is usually easy to obtain soil where no crop damage will be involved.

Preparing the cavity for filling requires that weeds, roots, and debris be cleared away from its mouth, which is enlarged when necessary to facilitate pouring the mud fill. Sack breakers are installed as a stopper or plug at those locations where the cavity comes back out of the ground.

Soil and water are mixed in the plaster mixer and the mud is poured into the mouth of the cavity directly from the mixer. The cavity is filled to within 18 to 24 in. of the surface and is finished off with dirt to form a dry bridge which reduces the hazard to livestock. A soupy mud consistency will facilitate filling the cavity to its farthest reaches.

Where the slope is not sufficient

THE AUTHOR

Harold J. Averett, district foreman, Northern Natural Gas Co., worked 8 years for a number of pipeline contractors in the Middle West after completing high school. He was employed by Northern Natural at Paullina, Iowa, on June 7, 1940. In December of 1943 he was promoted to district foreman at Mullinville, Kans., has worked in that capacity ever since and is currently headquartered at Oakland, Iowa.

**MIXER** at mouth of cavity. Weeds, roots, and debris must be cleared away from the mouth of the cavity.

**MUD** and water is fed into the plaster mixer, from where it will be poured directly into the cavity. A soupy mud consistency is used.

**OVER-ALL VIEW** of the mixing operations shows the 1.05-cu.-ft. air compressor and water tank on lowboy to the right of the mixer and tractor. Four to six men are used in the project.

**SHOP-MADE** spring-toothed harrow with hydraulic drawbar lift conditions the surface of the backfill.

for a gravity flow that will carry the mud to the extremities of the cavity, the mud is agitated and pressured with a compressed-air jet. A wand is used for this purpose made of 12 ft. of ½-in. pipe with a suitable length of hose connected to a 105-cu. ft. air compressor.

As the dry cavity walls absorb the moisture from the mud, flow is retarded and sometimes stopped during the early stages of the pour. To keep the mud sufficiently fluid to reach the end of the cavity, water must be poured into the hole at frequent intervals.

What can be accomplished with the mud-backfill process was demonstrated in 1955 when a backfill wash was discovered on a hill over a 26-in. gas pipeline. The visible hole was 3½ ft. in diameter by 28 ft. deep and it was later estimated that the wash extended under and along the pipe 375 to 400 ft.

The cavern was filled with mud using only gravity feed, as the fall of the slope was sufficient and air agitation and pressure were not required to obtain full penetration. This repair has withstood weathering, including some very heavy rainfalls, without further washing.

Mud has also proved very effective in earth-dam construction as a bond between flume pipes and the earth fill. This technique resists washing along the pipe during the earth-settling period.

### Surface Erosion Control

Proper conditioning of the backfill surface is of prime importance in the control of surface erosion. The tool we use for this work is a shop-made spring-tooth harrow which is attached to a small wheeled tractor with a hydraulic drawbar lift. This equipment is made up of a 4-in o.d. pipe about tractor width, with spring teeth welded to it on about 12-in. centers.

The harrow is pulled diagonally across the right-of-way or on the contour of a hill over newly constructed pipelines. The furrows made in this manner tend to divert water across and away from the backfill ditch and prevent concentration of water over the backfill. Also, dozer scars on the soil are eradicated and the ground loosened, which prepares the land more to the satisfaction of the landowner.

On new construction in hilly terrain, we have found that sack breakers properly installed are a big deterrent to washing and erosion during the backfill-settling period. Sack breakers are placed under the pipe prior to lowering and after lowering are continued on top of the pipe up to approximately half the depth of the ditch. The breakers are spaced 100 to 300 ft. apart, depending upon the grade.

It has been noticed that backfill which has not been ridged up on newly constructed right-of-way takes moisture better and settles more evenly. When backfill is compacted with dozer equipment, the soil settles underneath the compacted surface. The void which is left below the surface is hazardous to farm equipment and livestock as well as being an ideal condition for a future wash.

These methods have reduced backfill maintenance costs and have promoted excellent company-farmer relationships. Even skeptical landowners and tenants have expressed satisfaction after observing the results.

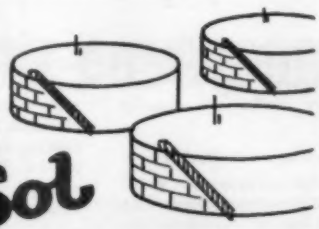
## HOUSTON CONTRACTING MEN OF EXPERIENCE

*Build Better Pipelines*

The majority of the men on Houston Contracting Company spreads—welders, cat drivers, truckers—are professional pipeliners, often with twenty to thirty years' experience. These men are YOUR guarantee of better-built pipelines.

**Houston**
CONTRACTING COMPANY
GENERAL CONTRACTORS
Lawrence B. Fawvor • R. P. Gregory • Geo. A. Peterkin
OIL • GAS
GASOLINE
WATER PIPELINES
2907 BUFFALO SPEEDWAY
HOUSTON 6, TEXAS

# RECLAIM TANK BOTTOMS with BrakeSol



**the most effective chemical for treating**

## PARAFFIN

**The money you make on reclaimed tank bottoms by using BRAKESOL will be substantially more than the cost of treating . . . including chemical and labor. Safe for use in production, pipeline and refinery equipment . . . Contains no chlorides, sulphides or other halides. BRAKESOL Treating Engineers have the experience and know-how to do a successful job. Contact them now!**

**TREATING ENGINEERS AVAILABLE AT THESE LOCATIONS**

Ardmore, Okla. 6489
Carmi, Illinois 5948
Ft. Morgan, Colo. UN 7-2235
Houston, Texas HO 5-6648
Kilgore, Texas 3210
Lovington, N. M. 6-6881
New Iberia, La. EM 4-0361
Odessa, Texas EM 6-4511
Pratt, Kansas GR 2-3745
Edmonton, Alberta 66-6950
Shreveport, La. 8-1962
Oklahoma City, Okla. VI 3-6629 WH 9-3854
Or Call Your Supply Store

**BrakeSol INC.**

P. O. BOX 5316 • OKLAHOMA CITY, OKLA.
EXPORT SUPPLY • THE NATIONAL SUPPLY CO. EXPORT DIVISION

# SEALTIGHT® PIPE SHIELD

**. . . The practical answer to PERMANENT PROTECTION against all ROCK DAMAGE!**

## Effective "holiday-free" pipe protection

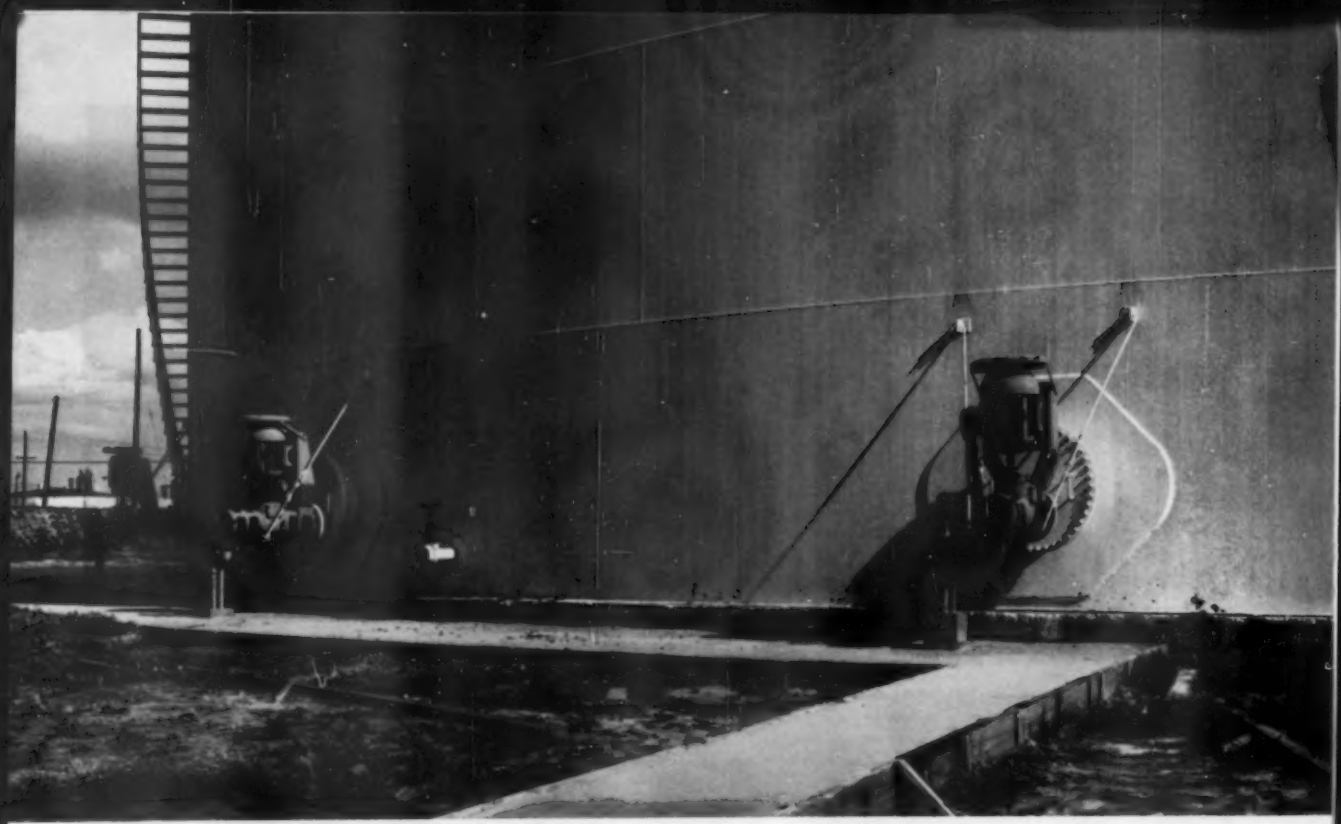
Sealtight Pipe Shield provides an easily workable protective shield for pipes in every type of terrain or installation. It is the one completely effective and economical answer to "holiday-free" pipe shielding . . . eliminates the expense of dirt padding. Penetration tests show that even large rocks fail to rupture this material. Ideal for protecting pipe sections pulled across swamps . . . replaces ineffective, costly wooden slats or snow fence materials in shielding coated pipes at river crossings and under river clamps. Sealtight Pipe Shield is impervious to stress and strain of soil movements—unaffected by soil chemicals and moisture. Records of on the job tests prove Sealtight Pipe Shield far more effective and less costly than ditch padding installations.

**EASILY APPLIED**

**Sealtight Pipe Shield is quickly and easily installed by untrained crews. The necessary straps, tools and seals are available and can be shipped as a complete package when desired.**

**WRITE TODAY FOR FREE TECHNICAL CATALOG.**

MANUFACTURED BY
**W.R. MEADOWS, inc.**
17 KIMBALL STREET • ELGIN, ILLINOIS



# You save $1000 per tank per year

## *when you keep bottoms clean by pressing a button*

Take a minute to add up what it costs you to clean out the sediment in an 80,000-barrel crude storage tank.

The answer—5000 to 8000 dollars—may amaze you. Yet these figures are based on careful field studies by a major pipeline company.

Your total cost includes:

- what you pay for cleaning
- your overhead while the tank is out of service
- value of refinable oil and wax you lose in the bottoms (at least $2000—and sometimes as high as $6000).

Fortunately, this is one expense you don't have to accept. Prevention is easy.

Put LIGHTNIN Mixers on your tanks, and start enjoying savings *on the order of $1000 per 80,000-barrel tank per year.* Savings on larger tanks are equally spectacular.

### No need to scrape out sludge

You eliminate sludge buildup—for good—when you install LIGHTNIN Mixers. By pressing a switch button, you start the tank contents in gentle motion that keeps sediment suspended in the crude, or resuspends any that has settled. You can keep bottom sediment level, year to year, as low as *one inch.*

You dispatch a more uniform crude when you use LIGHTNINS in your tanks. Crude leaving the tank has the same values as when it entered the tank. You overcome the risk of large slugs of accumulated sediment breaking loose and moving into the pipeline.

By eliminating downtime for sludge cleanout, you keep your tank farm's *full holding capacity* ready for use when you need it. You gain as much as 12% more storage capacity—without adding a single tank.

### Do this today

More than 50 independent pipeline companies and about 35 leading producers and refiners are cutting crude storage costs this effortless LIGHTNIN way. So can you! To see how, just call in your LIGHTNIN Mixer representative (listed in Pipeline Composite Catalog). Or write us direct.

**Lightnin® Mixers**

**MIXCO fluid mixing specialists**

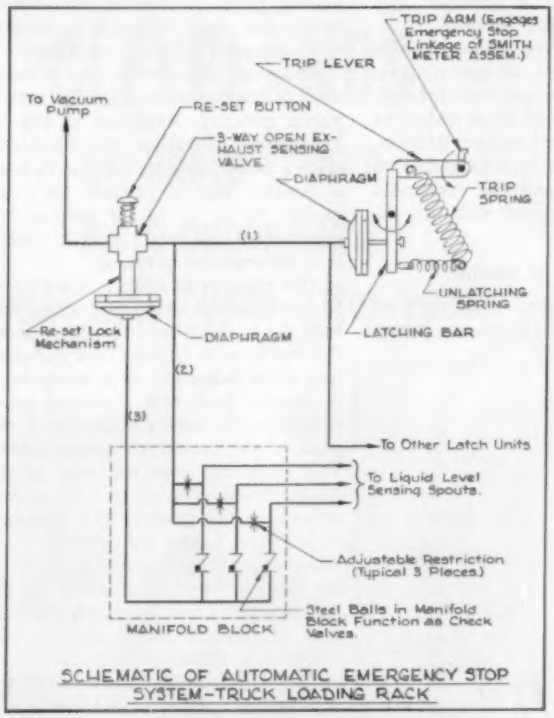
**LOW OPERATING COST.** It takes as little as one hour to suspend sediment in a full tank. Upkeep is simple; choice of stuffing boxes to meet your conditions, or mechanical seals that eliminate stuffing-box maintenance.

**Get these helpful bulletins** on BS&W control and LIGHTNIN Mixers. Check, tear out and mail to us today with your name and company address. Free—no obligation.

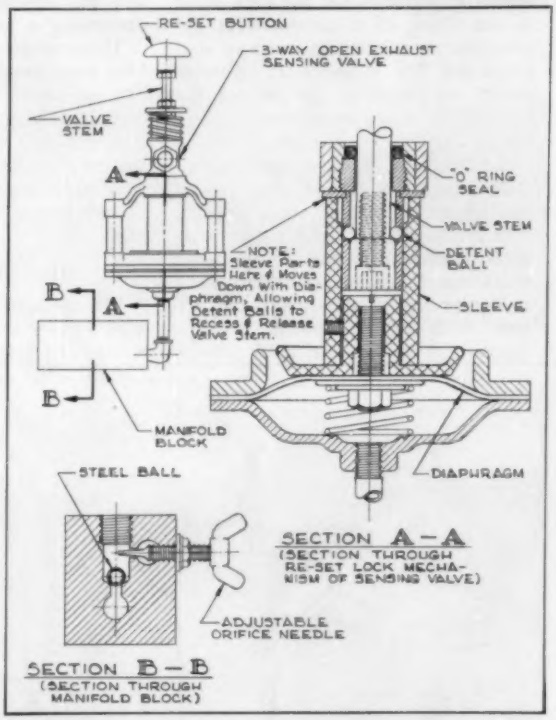
- ☐ BS&W Control with LIGHTNIN Mixers (B-503)
- ☐ Side entering mixers, 1 to 25 HP (B-104)
- ☐ Data sheet for figuring mixer requirements (B-107)
- ☐ Condensed catalog describing LIGHTNIN Mixers—all types (B-109)
- ☐ LIGHTNIN rotary mechanical seals for extra-low-cost mixing (B-111)

**MIXING EQUIPMENT Co., Inc., 174-j Mt. Read Blvd., Rochester 11, N.Y.**

*In Canada: Greey Mixing Equipment, Ltd., 100 Miranda Avenue, Toronto 10, Ont.*




**AUTOMATIC EMERGENCY** stop system at loading rack. Fig. 1.



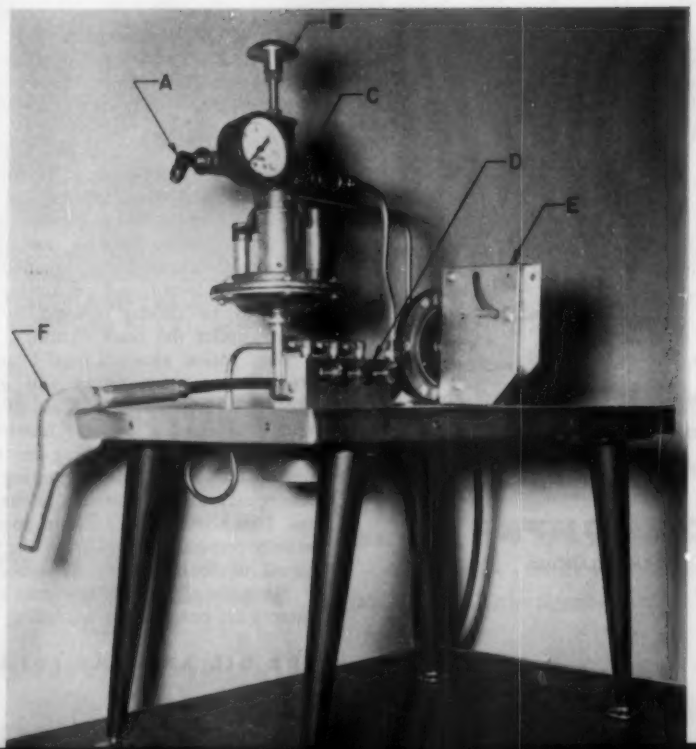

**SENSING VALVE** is heart of the automatic shutoff. Fig. 2.

# Automatic emergency shutoff safeguards against spills at products pipeline terminal

**BY W. B. ANDERSON**
Research Engineer
**AND R. R. HANCOX**
Director of Research
Great Lakes Pipe Line Co.

ONE OF THE HAZARDS inherent in the operation of a products pipeline terminal is product spillage during loading operations. In addition to the hazard of fire, there is the time loss in cleanup before loading can be continued and the undesirable fouling of the tank-truck or tank-car exterior.

Like most terminal operators, Great Lakes Pipe Line Co. uses set-stop meters in the loading operations. However, due to malfunction error, or product boiling occasional spills may




**SHUTOFF COMPONENTS** . . . (A) connection for vacuum pump line, (B) reset button, (C) three-way open exhaust sensing valve, (D) manifold block, (E) meter latch assembly, (F) sensing spot. Fig. 3.

occur. In order to guard against this possibility the loader has been required to stand beside the rack valve as the filling of a compartment approached completion in order to shut down the line if necessary. This in nearly all instances has limited the loading to one compartment at a time.

To provide a safeguard against spills and also permit the use of multiple-spout loading, an automatic emergency shutoff device for tank-truck loading has been developed in the Great Lakes research laboratory. It is now in use throughout the system. With this equipment a single loader has on occasion loaded as many as six compartments simultaneously and the equipment is credited with preventing a number of spills.

Three models of the shutoff device have been developed, all operating on the same basic principle but differing considerably in detail. After extensive field tests of a limited number of units, the third model has been judged to be most satisfactory and the remainder of our system equipped with this design.

### Operation of Shutoff

The following discussion together with Figs. 1 and 2 explain the theory and method of operation. Since all our terminals are equipped with truck-loading meter assemblies, the shutoff device has been designed to actuate the emergency stop of the meter.

The term "vacuum" is used to mean any pressure below normal atmospheric pressure. Referring to Fig. 1, in normal operation the three-way open exhaust sensing valve is in such a position that a vacuum (approximately 10 to 13 in. of mercury) is maintained in Lines 1 and 2. Line 3 is at atmospheric pressure.

The vacuum in Line 1 is sufficient to overcome the unlatching spring and hold the latching bar in position under the trip lever as shown. Line 2 divides into three branches, each terminating in flexible hose with a sensing spout which can be readily hooked over the edge of the tank-truck compartment. This spout fits over the edge of the compartment opening in such a way as to limit the product to a predetermined level below the opening.

At a convenient point in each of the branch lines is installed an adjustable restriction by which the vacuum in Lines 1 and 2 can be controlled and which permits correction of individual differences between the sensing hoses. Each branch line is also connected at a point beyond the adjustable restriction to the reset lock mechanism of the three-way valve as shown.

As indicated above in normal operation Lines 1 and 2 contain a vacuum while in the branch lines beyond the restrictions and in Line 3 atmospheric pressure exists. However, should the opening in one of the sensing spouts become covered with product or foam, a vacuum immediately appears in that line beyond the restriction. This vacuum is communicated through the connecting check valve to Line 3, at the same time firmly closing the other two check valves.

Referring to Fig. 2, when a vacuum in Line 3, the diaphragm of the sensing valve is pulled down against the light restraining spring. This carries downward the double-hatched portion of the valve, allowing the detent balls to move outward and permitting the valve to be driven upward by the spring under the reset button.

This action closes Lines 1 and 2 from the vacuum pump and opens them to the atmosphere. Loss of vacuum in Line 1 allows the unlatching spring to move the latching bar from under the trip lever, actuating the emergency stop mechanism of the meter. This action occurs within approximately one-half second from the time liquid or foam covers the spout.

Since the shutoff attachments of all meters on one side of a loading rack

"... and PARKHILL'S stringing the pipe!"

Anywhere . . . anytime!
Parkhill has the men, the equipment
and the experience to handle your next pipe
stringing job, large or small. Give us a call
and park your problems with Parkhill.

PARKHILL TRUCK COMPANY
POST OFFICE BOX 3807 • TULSA, OKLAHOMA

# CLEVELANDS

## dig more trench more dependably year after year after year

**THE CLEVELAND 92**—for field, lease, water lines, digs to 20" wide, to 5' deep.

**THE CLEVELAND 110**—for all types of smaller lines, digs to 24" wide, to 5½' deep.

**THE CLEVELAND 140**—the leader in its field for 20 years, digs to 30" wide, for pipe up to 22" diameter.

**THE CLEVELAND 240**—fits pipeline jobs of all kinds, digs 20" to 36" wide, to 6'3" deep.

**THE CLEVELAND 320**—the ultimate for pipeline trench, digs 22" to 52" wide, to 7½' deep, digs for 36" pipe.

**PROVED** on thousands of miles of pipeline work of all kinds throughout the world

Good Everywhere

**The CLEVELAND TRENCHER Co.**

**20100 St. Clair Avenue • Cleveland 17, Ohio**

A crude oil pipeline pumping station on the Gulf Coast of Texas. Here four E-M Sil-Clad Motors are on outdoor duty. Two are rated 500 hp and two 600 hp, at 3600 rpm.

# WHERE'S THERE A MOTOR

## that'll take more than the weather can dish out?

Exposure to scorching sun, sticky humidity, drenching rain, and corrosive salt air doesn't affect the operation of the four E-M Sil-Clad Weather-Protected Motors pictured above. They continue to drive crude oil pumps at a Texas Gulf Coast pipeline station with no more attention than routine bearing inspections.

Here are the maintenance-saving Sil-Clad features:

**CORROSION RESISTANT INSIDE AND OUT.** All exposed metal parts are protected with baked-on silicone. Fans, baffles and screens are stainless steel. Weather-protected construction eliminates internally corrosive "breathing."

**INSIDE STAYS CLEAN.** High intake air lift thru baffles at low velocity drops out foreign matter. Blow-thru passages by-pass gusts.

**AGE-DEFYING INSULATION.** A baked-on silicone "envelope" insulates Sil-Clad Motor coils. The coils repel moisture and salt air, resist high ambients.

**EASY TO GET AT.** Bearing inspection thru ports and hand holes. Hood lifts off for complete access.

Sil-Clad Motors can give big savings in refineries and on off-shore rigs, too. When you're considering a motor for outdoor duty in damp or corrosive atmospheres, ask your local E-M Sales Engineer about Sil-Clad Motors. Our factory will also be glad to send you a copy of Publication 209 which tells more about E-M silicone protected motors.

E-M

1300-TPA-2148

**ELECTRIC MACHINERY MFG. COMPANY**

Minneapolis 13, Minnesota

*Specialists in making motors do*
**EXACTLY WHAT YOU WANT THEM TO**

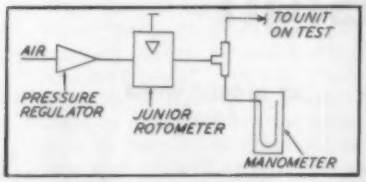
are connected in parallel, all meters on this side are shut down simultaneously and the latch must be reset before operations can be resumed. Also the reset button of the three-way valve must be depressed to lock in operating position before the shutoff can again be activated.

Separate units are provided for each side of a loading rack. Thus, each loading spot operates independently of all others at a terminal. The use of three sensing lines at each loading spot has been selected as the most suitable for our operations. The number is, however, optional and can be varied as desired by the operators.

**Shutoff Components**

Essentially the shutoff consists of four items conveniently located and connected by copper tubing or flexible hose. These are (1) the vacuum pump mounted under the rack at one end, (2) the latch mechanism attached to each meter, (3) the three-way open exhaust valve and manifold block connected together and mounted below the rack with the reset button extending above the platform to facilitate resetting and (4) the flexible hose and spout assembly mounted on takeup reels under the platform.

Fig. 3 shows the components of the shutoff assembled on a stand for display purposes. These are actual components, identical with those in use at our terminals. One item, the vacuum pump is not shown; it is a small pump capable of 1 c.f.m. at a vacuum of 11 to 13 in. of mercury. Also the takeup reel is not included; it has no effect on the operation of the shutoff, being used only for convenience in handling the flexible hose and sensing spout.




## Instrument unit measures pressure

A COMPACT INSTRUMENT GROUP can be set up for measuring pressure differentials through bleed taps and also to check valves at various measured gas rates.

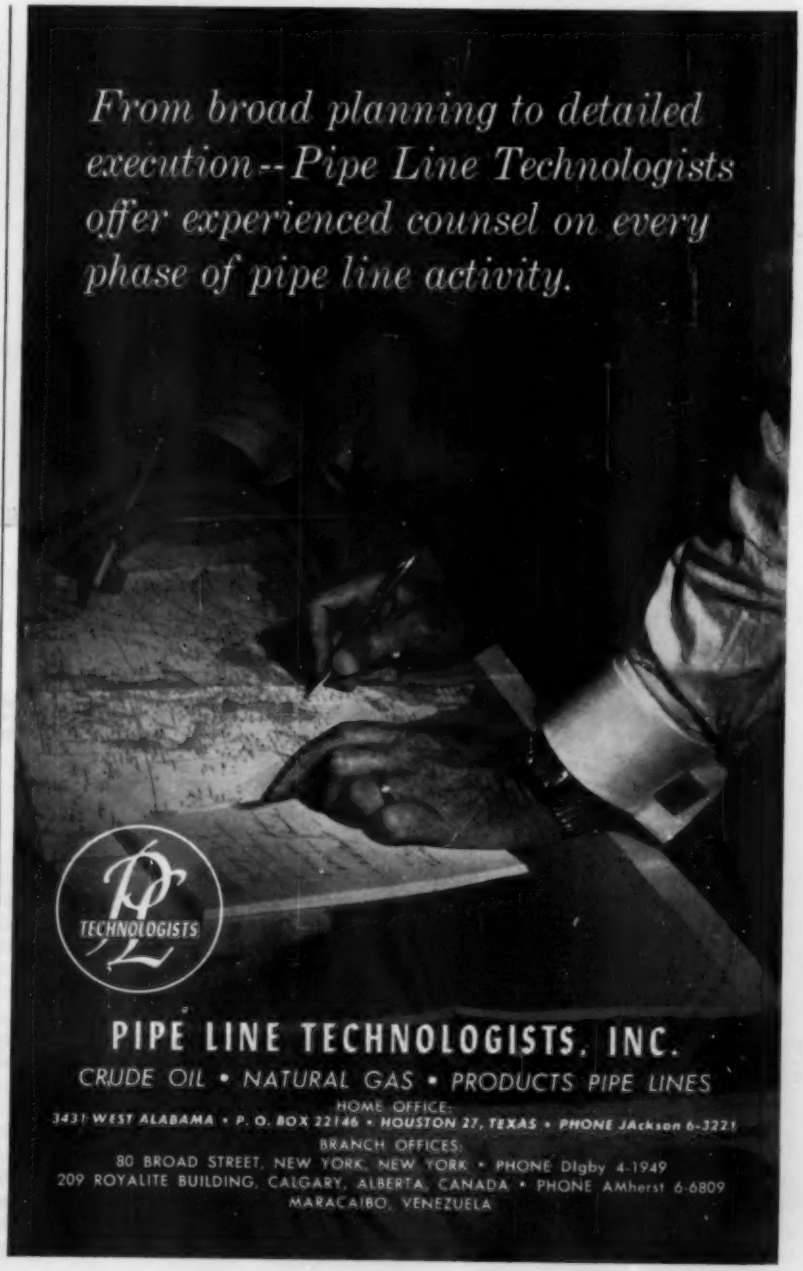
The arrangement consists of a reducing regulator, a junior rotometer (0-4 cm.) and a manometer. Sixty-pound air passes through the regulator and the rotometer and then through a tee which splits it between a water manometer and a line to the unit being checked.

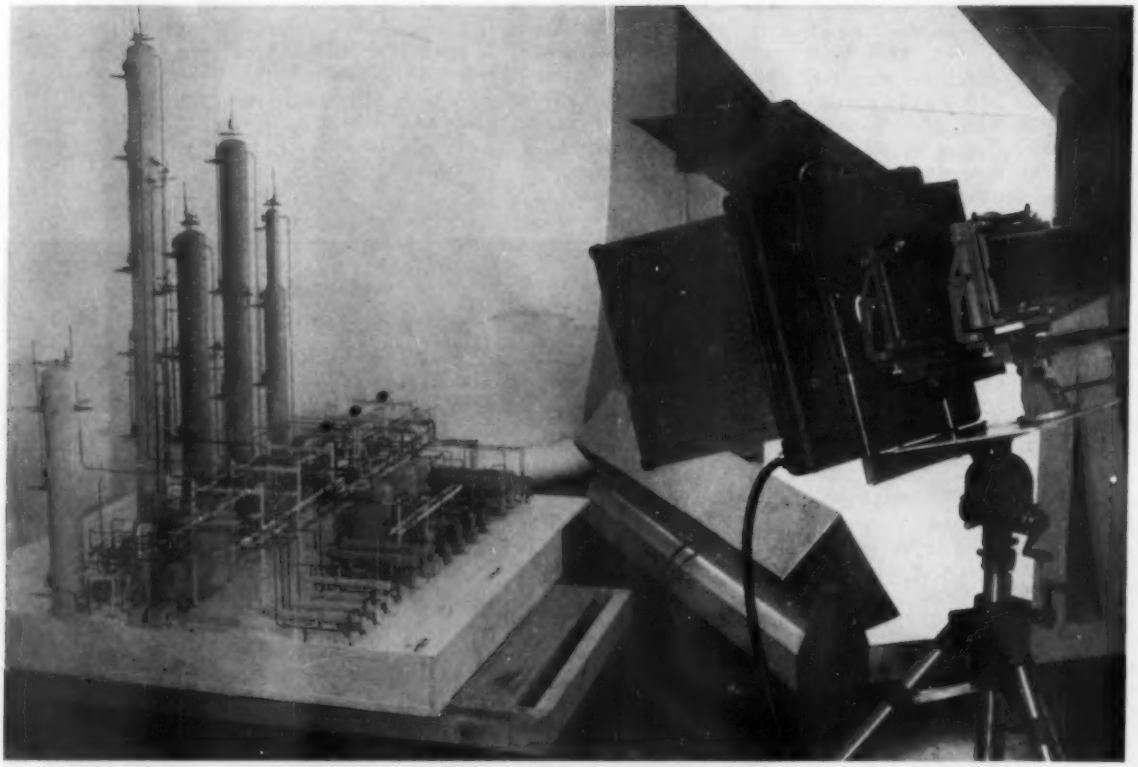
Measurement of catalyst inventories in fluid catalytic cracking units is made by determining differential pressure across the vessels of the unit. It is necessary to bleed gas into the vessels in order to keep the pressure taps unplugged. When pressures are measured this way they are in error by the amount of differential required to force bleed gas through the taps. This error is of sufficient magnitude to make readings unreliable.

With the test device, bleed gas rates are selected which will give identical pressure differentials for the two taps of a differential pressure recorder, thereby eliminating the error.

The device is also used to determine the differential pressure characteristics of gas check valves. From data accumulated this way, modifications can be made to the design of the valve.

Method suggested by J. F. Daniels, instrument repairman. Courtesy Humble Oil & Refining Co., Baytown, Tex.



From broad planning to detailed execution -- Pipe Line Technologists offer experienced counsel on every phase of pipe line activity.
PL
TECHNOLOGISTS
PIPE LINE TECHNOLOGISTS, INC.
CRUDE OIL • NATURAL GAS • PRODUCTS PIPE LINES
HOME OFFICE:
3431 WEST ALABAMA • P. O. BOX 22146 • HOUSTON 27, TEXAS • PHONE JAckson 6-3221
BRANCH OFFICES:
80 BROAD STREET, NEW YORK, NEW YORK • PHONE DIgby 4-1949
209 ROYALITE BUILDING, CALGARY, ALBERTA, CANADA • PHONE AMherst 6-6809
MARACAIBO, VENEZUELA



The camera trained on this scale model will provide photographed drawings to help

# Speed process-unit design

BY GEORGE WEBER
Editor

SCALE MODELS of new refinery processing units are rapidly becoming commonplace. They are no longer merely showpieces. Their functional usefulness is well established on several counts.

Sun Oil Co. has brought the model one more step toward practical use. In addition to the conventional applications of models, Sun engineers are using special photography. A rectilinear camera is used to make photographic plot plans and elevations. A conventional camera is used to make perspective "drawings."

In reducing the number of detailed conventional drawings required, they have cut costs. Equally important, models plus photography have materially reduced the time required to get a new process unit ready for the construction contract.

Prints of closeups and angle shots serve to free design groups from much tedious and costly drafting work. Changes in layout and design can be made and photographed in a fraction of the time required for redrafting.

**Three objectives . . .** Sun people are the first to admit they haven't found all the answers. They see further uses they can make of this cost-cutting idea. But progress has reached a point where they are getting results on three primary objectives of their model program.

First, the model serves ideally for crystalizing the ideas and suggestions of all personnel concerned with the new unit under design. By the time it is finished, the model incorporates the best features from the standpoint of design, construction, operation, and maintenance.

Sun's second objective bears on the company policy of controlling the design of its refinery units. The company feels that by application of models it can now make better use of its own limited manpower to design larger jobs than was formerly possible. Sun does this by using its own designers and draftsmen to develop those features of an installation which Sun prefers to control and delegating to

engineering contractors the design and drafting for other phases of the work.

Thirdly, Sun expects to substantially cut the costs of piping design and drafting. Even more important, such drawings as are required can be produced faster, and with more confidence that they reflect those features which are important to all concerned.

**Functional, not fancy . . .** The Sun models are not fancy, but they serve the functional purpose for which they are intended. The scale is ⅜ in. to 1 ft. Most of the equipment items are fabricated in the model shop. Vessels are made from tubular Plexiglass stock.

No attempt is made to exactly duplicate compressors, pumps, exchangers, and other equipment items. But location of flange surfaces and other piping connections are to scale. Pipe racks are represented in typical fashion, properly located and scaled to show only over-all dimensions and correct elevations for main pipe runs.

Chemically blackened brass rod, 1/16-in. in diameter, is used to depict centerline of piping. Wherever piping is supported, or where clearance is critical, short pieces of plastic properly scaled to pipe diameter are attached. The rods are bent to proper radius for centerline of pipe.

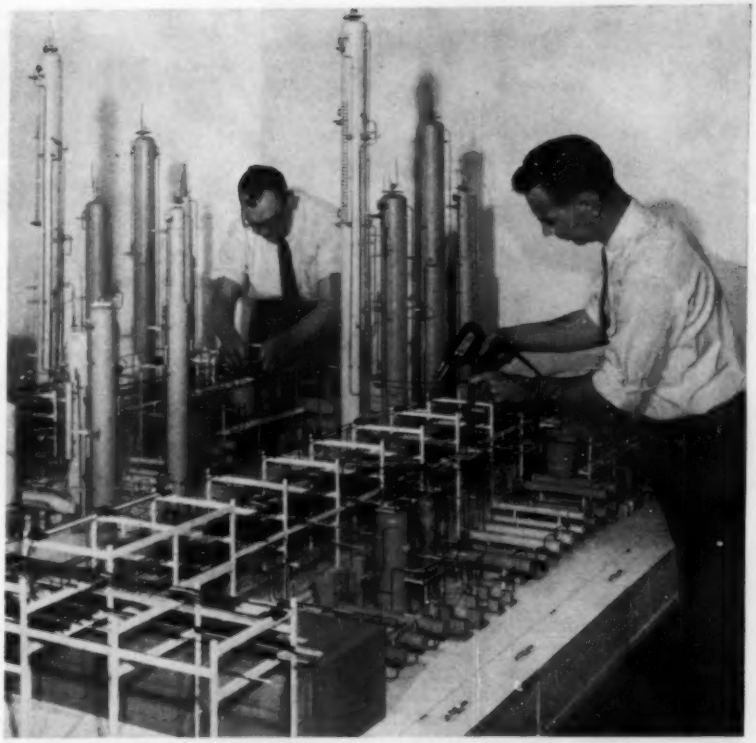
White piping tags showing flow direction, the line's diameter, and code number are snapped on all lines in positions where they will photograph to best advantage.

Space reserved for instrument tubing and electric conduit runs is indicated on the model.

**Piping layout . . .** Model makers do not use continuous lengths of brass rod in the piping models. The rods are broken at intervals and joined by small sleeves to avoid the need for precisely measuring and cutting the simulated piping. Once in place, the rods can be adjusted to proper alignment by expanding or contracting the gaps in the sleeves. The sleeves are then spot-soldered to hold the piping intact. These sleeves are so close to rod diameter that they are not evident in finished photographs. Pipe tees are used in the same manner.

Models are not color-coded, but color contrast is used to get clear photos. Structural shapes are pink, to accentuate the black piping. Vessels, structures and other features may be soft shades of buff, yellow, pink, or blue. The board itself is finished in dull white lacquer, gridded in black.

The model evolves gradually, as design and engineering on the new unit progress. The first step is a preliminary layout and study of the location of equipment, buildings, and other items on the selected site. This is done by the project group using either paper templates, transparent overlays, plant-layout models or any combination of the three.



**WORKING** to a scale of ⅜-in. to 1-ft., model makers produce their miniatures without trying to exactly duplicate equipment items, although location of flange surfaces and other piping connections are to scale.

**Plot plan . . .** Once approved, this layout is used to make a plot plan for the over-all plant area. This is drawn to scale giving basic dimensions and coordinates. At the same time, the model shop is advised concerning the necessary equipment to be fabricated for use in constructing the piping model.

Transparencies of the plot plan drawings are made and used as background or geography for producing other drawings and studies such as:

1. Composite layout of underground work including sewers, piping, electrical ducts and manholes, foundations, and other underground structures.

2. Diagrammatic studies of piping aboveground to determine the best arrangement, routing, and locations of main pipe runs.

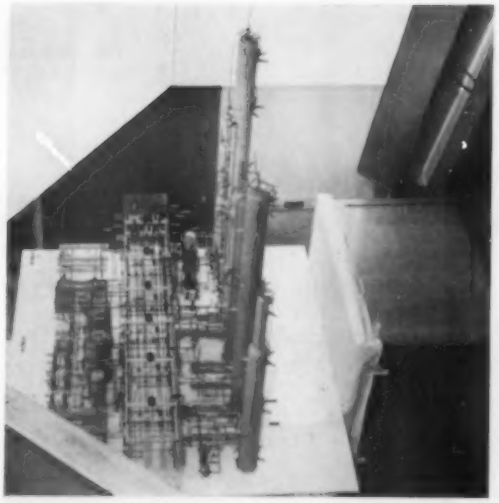
3. Approximate location and routing for main trunks of electric wiring and instrument systems.

From these plot studies, the number, size, and general contour of plot boards (for piping model) are determined. Plot boards are kept to a size which will photograph well and be suitable for enlargements on standard drawing-size sheets. Consideration is given to handling, shipping, and storing of models when determining size of plot boards.

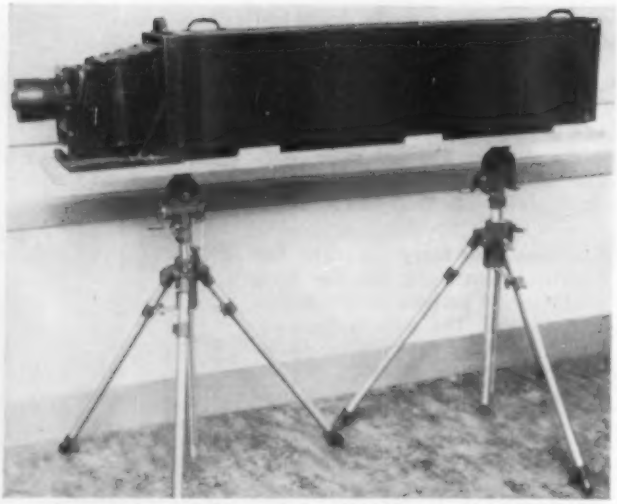
**Piping model . . .** Using flow diagrams and plot studies as a basis, the piping model is constructed by the design division. The actual assembly is performed in the drawing room where project engineers, designers, and model makers work in close coordination as the model is developed. Thus the model becomes a focal point of interest and promotes closer communications between engineers and the various branches of design, particularly piping, pipe-stress analysis, structural, electrical, and instrumentation. This feature in itself is a time saver.

At appropriate times operators, maintenance personnel, and mechanical specialists are brought in to consult. Their suggestions on clearances, accessibility, safety, location of valves, and many other aspects of operation and maintenance are incorporated in the model as it is built.

The merging of all these concepts in the model design as it takes shape results in a final design which represents the best solution from all view-



**MOST EQUIPMENT ITEMS** are fabricated in the model shop. Vessels are made of tubular Plexiglass stock.



**RECTILINEAR CAMERA** was made from regular 8 by 10-in. view camera fitted with a long-focal-length lens. Camera box was then lengthened to suit the focal length of the lens.

points. Meanwhile, conventional drawings are being made for other subjects which do not lend themselves readily to model techniques.

For example, steel and concrete structures, towers and vessels, pipe-fabrication sketches, and typical arrangements for instruments and controls.

**Plot boards . . .** These are made rigid enough to tip 90° without distortion. This permits making photographic plot plans as well as elevations. The rectilinear camera was fashioned from an 8 by 10-in. view camera fitted with a long focal length lens. The camera box was lengthened as required to suit the focal length of the lens. The model is photographed from a distance of about 50 ft. To reduce parallax to a workable minimum. At this distance, the photographic image approaches an orthographic projection.

The method of lighting models for photographic plan views is similar to that described by Tucker[1]. Portable reflector units 5 ft. in length and 8 ft. high have eight 300-watt lamps are used to illuminate the model with diffused light.

Perspective shots made with the conventional camera use the reflector units. together with an arrangement of fluorescent tubes about the lens of the camera.

**Photographing . . .** For photographing, the model is simply moved into a corridor adjacent to the design area. The camera is placed at the proper distance down a corridor. For plot plan shots, the model is merely upended.

The distortion, even for tall fractionating towers is barely noticeable even on enlargement prints of these plot plans. This distortion is not serious at any rate, since the resulting "drawings" are dimensioned to center lines of equipment.

Once photographed, the negative (4 by 5 in.) is projected on sensitized tracing cloth of standard drawing size which is commercially available. Dimensions, notes, alterations, and additions can be made directly on this positive. Erasures are possible and this permits redrawing minor changes, as a draftsman would do on a tracing. This tracing is used in turn to make any number of contact prints for field use.

If the positive is spoiled, it is a simple matter to project another from the original photo. Here is an obvious advantage. This is not always the case when the time element does not allow the complete redrafting of a major drawing.

**Model changes . . .** On occasion, changes are in order on the model itself. Little time delay is incurred in changing and rephotographing the model. This can be accomplished without compromise in desired features of design.

A number of perspective shots are also made of the model. These can be printed, together with the plans and elevations, on the same sheet. Such composites are then used to help orient and visualize the whole unit, and to reference larger views and sections.

Some piping drawings are still made depending on the complexity of the installations. Pipe-fabrication sketches are drawn of individual pipe runs. These may be drawn from the model itself. They give specific dimensions and bills of material and are identified with the same line number shown on the flow diagram, line table, and model. Continuations are referenced at each end. The bill of material is classified as to source, i.e., field storehouse or fabrication shop.

**Field use . . .** Having served its photographic purpose, the model then goes to the field when actual construction begins. There it furnishes a convenient reference in three dimensions, when drawings need interpretation.

As the unit nears completion, the model serves still another purpose. Operating crews find it particularly useful in visualizing the complete setup, during their training period for initial operation.

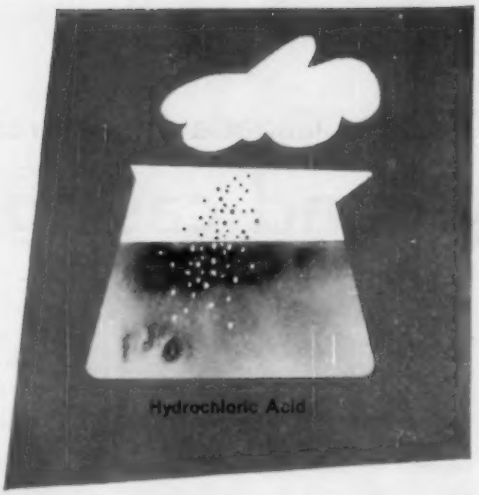
Sun teams recently followed this model procedure in designing a complex gas-purification and recovery system planned for the Marcus Hook refinery. The model was built in a few months. While it is not now possible to compute the savings the company realizes by using models, Sun is achieving its three objectives with a minimum outlay:

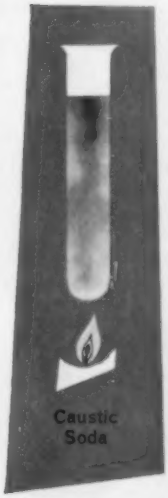
1. The system is completely designed by company personnel.
2. It incorporates the features desired by all concerned.
3. The project is made ready for construction in a minimum period of time.

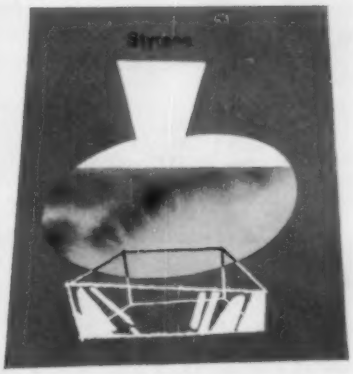
### Reference

1. "How Photodrawings Work With Models," T. S. Tucker, Pet. Proc., April 1957.

*which of these*
*<u>can't</u> be stored in a*
**GENERAL AMERICAN TERMINAL?**







*<u>answer</u>! General American <u>can</u> store them all! (and does!)*

Six "problem" products! Yet each can be stored safely and economically at General American Tank Storage Terminals.

Whether your product is as volatile as methylene chloride, as corrosive as caustic soda or as viscous as molasses, General American can supply the storage facilities for your needs.

General American Tank Storage Terminals offer you the privacy, safety, service and flexibility of your own terminal—*without capital investment on your part.* Write or phone—today. You'll find... *it pays to plan with General American.*

Six terminals at 5 key-market locations with over 14,000,000 barrels capacity: PORT OF NEW YORK (Carteret, N.J.), PORT OF NEW ORLEANS (Good Hope, La.), CHICAGO, ILLINOIS (Bedford Park), PORT OF HOUSTON (Galena Park and Pasadena), CORPUS CHRISTI, TEXAS.

**GENERAL AMERICAN TANK STORAGE TERMINALS**

a division of GENERAL AMERICAN TRANSPORTATION CORP. *135 South La Salle Street • Chicago 90, Illinois*

TANK STORAGE TERMINALS GENERAL AMERICAN TRADE MARK

## Tests in Canada emphasize

# Sound casing procedures

## are vital in drilling

**In this, the last of three articles in the series, the case histories of two adjacent wells are used to show shale can be disintegrated by poor cementing practice.**

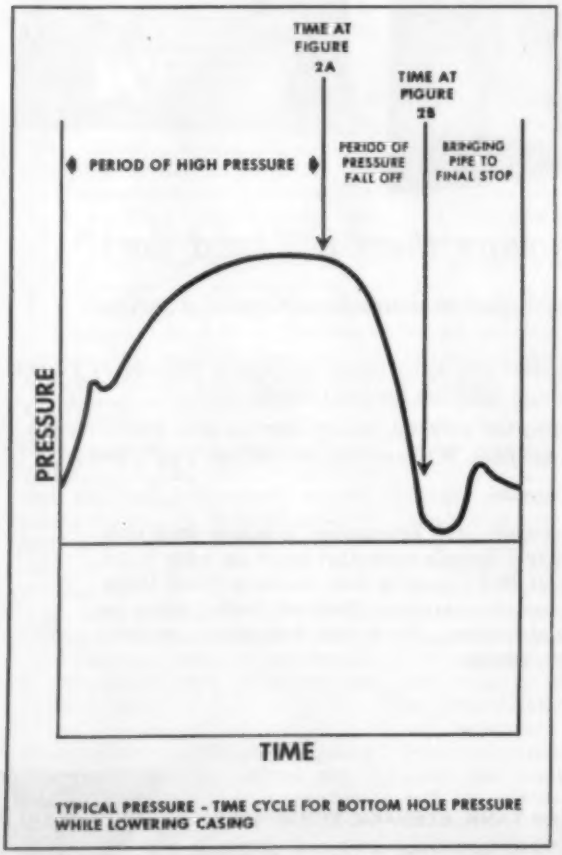
BY E. H. CLARKE, JR.,
and A. S. MURRAY

THE IMPORTANCE of the correct application of cementing procedure and a method of analyzing cementing problems were covered in Parts 1 and 2 of this series (August 25 and September 1). This article covers the running of casing in two offset wells (Imperial and another operator) to total depth of approximately 5,000 ft. near Edmonton, Alta. The advantages of a sound casing procedure will be evident.

E. H. Clarke, Jr., is with Baker Oil Tools, Inc., Los Angeles, and A. S. Murray is with Imperial Oil, Ltd., Calgary, Alta. Paper presented at API production division meeting, Los Angeles, 1958, under original title, "A Study of Primary Cementing."

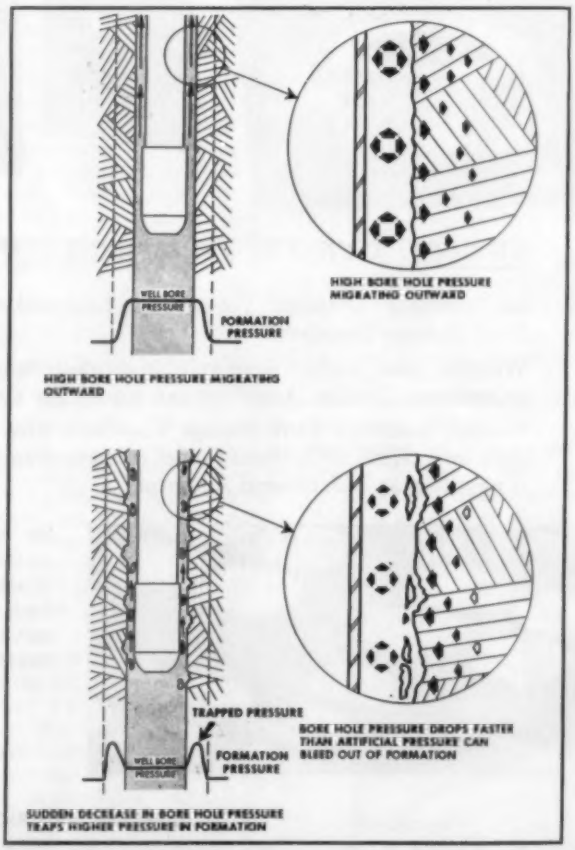
**Background information . . .** Shale sloughing, resulting in tight and bridged hole, was a common problem affecting the drilling time on these wells, and several fishing jobs were necessary. Trips were always hazardous, particularly in the section from surface to 4,000 ft. and trip time proved excessive in every well. Attempts to improve hole condition by using different types of drilling muds and by varying specific properties were unsuccessful. Surfactant and flocculant-type muds had been investigated. A study of the effect of high and low-water-loss muds on shales had shown that problem was not associated with filtration properties.

This was considered a problem area




TYPICAL PRESSURE - TIME CYCLE FOR BOTTOM HOLE PRESSURE WHILE LOWERING CASING

**HERE** is a typical pressure cycle obtained while dropping casing and stopping its downward motion rapidly in tight-clearance holes. Fig. 1.


HIGH BORE HOLE PRESSURE MIGRATING OUTWARD
WELL BORE PRESSURE
FORMATION PRESSURE
HIGH BORE HOLE PRESSURE MIGRATING OUTWARD
TRAPPED PRESSURE
BORE HOLE PRESSURE DROPS FASTER THAN ARTIFICIAL PRESSURE CAN BLEED OUT OF FORMATION
WELL BORE PRESSURE
FORMATION PRESSURE
SUDDEN DECREASE IN BORE HOLE PRESSURE TRAPS HIGHER PRESSURE IN FORMATION

**PRESSURE DISTRIBUTION** at the peak portion of pressure surge is shown in 2A at top. Condition caused by mud pressure drop is shown in 2B at bottom.

BP MAPS THE FUTURE

*Minutes saved in fuelling an aircraft mean a quicker journey for its passengers. Here, at Lisbon Airport, a BP man connects a mobile dispenser to the hydrant pit of the underground pipeline. The huge plane will be completely fuelled in about 15 minutes.*

# *1200 Gallons a Minute*

## ASTONISHING FUELLING SYSTEM SPEEDS THE WORLD'S AIRLINES

AIRLINERS HAVE A MAMMOTH THIRST. Today's biggest planes need as much as 18,000 gallons when they are fuelled. Tomorrow's planes will need 'fill-ups' of 24,000 gallons.

How to deliver such enormous quantities of fuel safely and at high speed sets a new problem. But that problem is being solved. Solved by the Hydrant System which, with the advice of BP, is being installed at an ever increasing number of the world's major airports.

### HOW IT OPERATES

Previously, fuel was always brought to an aircraft by a mobile tank fueller. Now, with the Hydrant System, it may be piped from the airfield depot direct to a hydrant on the concrete apron. From the hydrant the fuel passes to a mobile fuel dispenser which filters and controls its flow, and from this to the aircraft waiting on the apron.

### TORRENTIAL SPEED

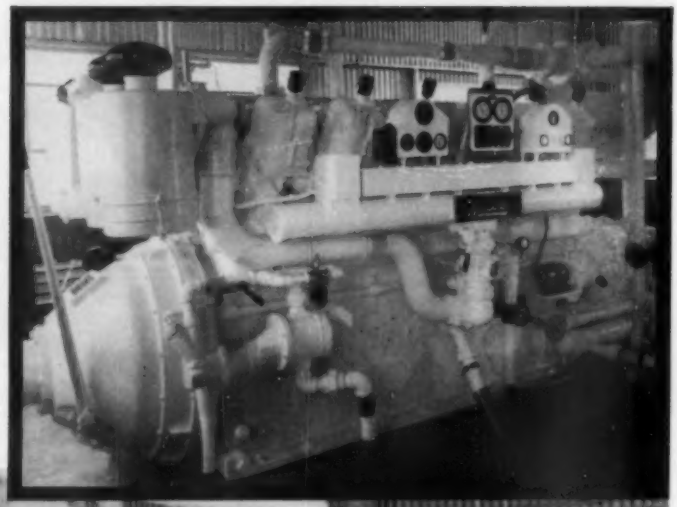
The great advantage of the Hydrant System is that virtually unlimited quantities of fuel can be delivered at *torrential speed – with complete safety*. In principle the system is simple but (particularly because of the pressures set up) to make it practicable has involved an immense amount of research and experiment by BP technicians.

This new development in aircraft refuelling is just one more way in which The British Petroleum Company plans for the future – today.

THE BRITISH PETROLEUM COMPANY LIMITED BP

# LOADING 40,000 bbl. per hour into Super Tankers

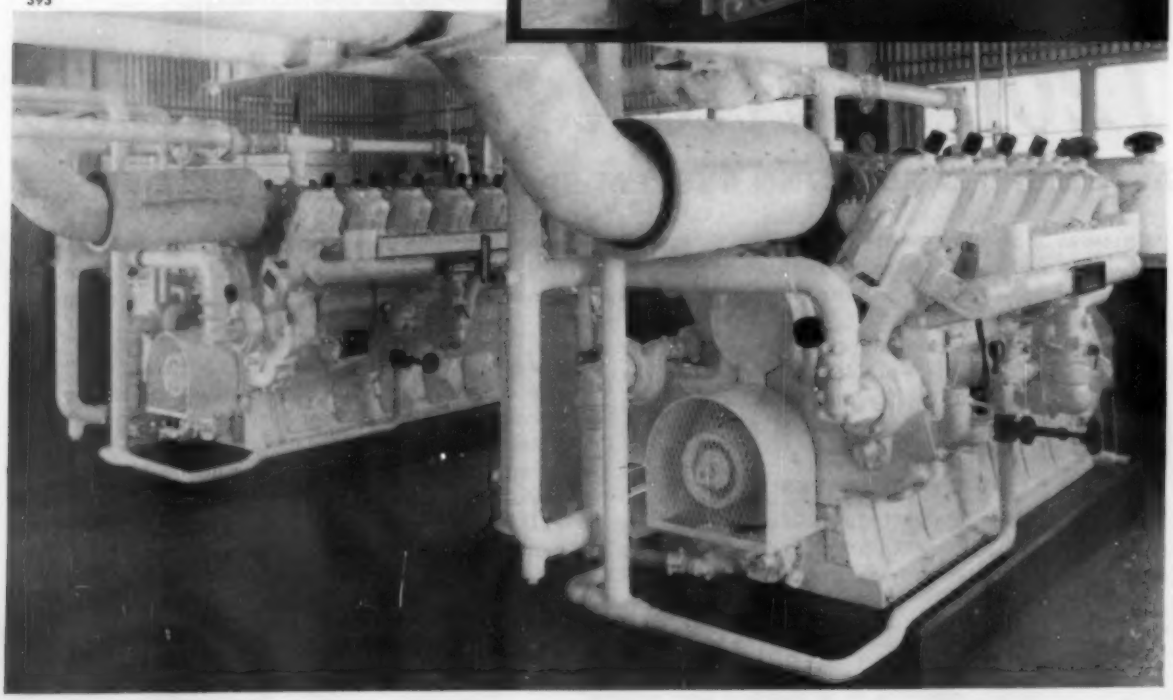
# 2 WAUKESHAS power the pumps



▶ At this station on the Mississippi River, super tankers are being loaded at what is believed to be the country's highest loading rate—40,000 bbl. per hour. Oil is pumped from 200′ diam. x 14′ high tanks through a 30″ line by two 3-stage Johnson vertical turbine pumps, each having a designed point of 17,500 bbl. per hr. at 196′ head. Driving each pump through Western gears, is a Model VLROBU Waukesha Gas Power Unit with a tremendously powerful, rugged 12-cylinder, high compression, overhead valve, 60-degree vee, four-cycle engine of 8½-inch bore and stroke, 5788 cubic inch displacement. Get Bulletin 1656.

**WAUKESHA MOTOR COMPANY • WAUKESHA, WIS.**
New York • Tulsa • Los Angeles

393



requiring close attention to drilling and completion practice. The formation was very uniform and both wells were exposed to the same conditions. Muds identical in type and properties were used. The usual difficulties were encountered on each hole while drilling. The wells were spudded at the same time and production casing was run simultaneously. Each well experienced difficulty during the casing job but of a different nature.

Nine-inch hole was drilled by Imperial while 8¾-in. was drilled on the offset. Imperial ran 5½-in. casing using fillup equipment for pressure reduction in accordance with their standard practice in this area. Seven-inch casing with float equipment was run on the offset well. Roughly the same number of centralizers and scratchers were used on each string of casing.

**Difficulties encountered . . .** Casing was lowered in the hole slowly on the Imperial well even though fillup equipment was being used and annular clearances were not critical. Average dropping time for the Range 2 joints was 12 seconds. The fastest dropping time was 9 seconds. Under these conditions well-bore pressure surges were virtually eliminated. There were about two shovels of shale recovered during the entire hole-cleaning operation. Unfortunately, when cementing was begun plugs were installed backward in the two-plug head and 2,500 ft. of cement was left in the casing. Pipe was landed and the cement was drilled out.

Clean hole and undamaged condition of shale bodies were evidenced 2 days later when less than 10,000 lb. was required to pull the pipe prior to recementing. The well was then conditioned and cemented while reciprocating pipe one full joint until the plug bumped.

Seven-inch casing equipped with floating equipment was run in 8¾-in. hole on the offset well without adequate knowledge of the magnitude of pressure surges that could be caused by fast dropping rate (5 seconds) in a restricted annulus. Bottom was encountered eight joints high. In trying to wash to bottom, circulation could not be broken until 12 joints were pulled. When circulation was established, shale began to come out in quantities exceeding the capacity of the shale shaker and a portion of the mud had to be bypassed directly into the pit. Eventually the pit filled with shale and the pump suction plugged. Casing stuck and only partial circulation was possible.

**How shale sloughs by mechanical**

## HERE'S the best procedure for running, cementing, and landing production casing

**APPENDIX I—Recommended Procedure for Running, Cementing and Landing Production Casing**

1. Placement of scratchers and centralizers.

   A minimum of scratchers and centralizers placed as follows:

   A. For normal cased-through completions:
      (1) Shoe joint . . . . . 1 centralizer 10 ft. above shoe; 5 scratchers
      (2) Above shoe joint 1 scratcher every 10 ft. with 10 ft. of free slide until 2 joints above pay zone.
      1 centralizer every other joint above shoe joint to 2 joints above pay zone.

   B. For open-hole completions
      (1) Shoe joint . . . . . 1 centralizer 10 ft. above shoe; 5 scratchers
      (2) Above shoe joint 1 scratcher every 10 ft. with 10 ft. of free slide on the second joint.
      1 centralizer on third joint from bottom.

2. Circulate hole clean and condition mud preparatory to running casing.
3. Running casing.

   Dropping time for various ranges of casing should not be less than the following values:

| | | |
|---|---|---|
| Range 1 | (20 ft.) | 10 seconds per joint |
| Range 2 | (30 ft.) | 15 seconds per joint |
| Range 3 | (40 ft.) | 20 seconds per joint |

4. Circulating casing prior to cementing.
   A. Fill pipe before putting on cementing head.
   B. Start rig pump slowly while breaking circulation.
   C. With full circulation, reciprocate pipe 5-6 ft. until pipe is totally free. Gradually increase the reciprocal interval to a full joint.
   D. Continue reciprocation of pipe until hole is clean.
5. Cementing
   A. Continue reciprocating pipe one full joint length while mixing cement.
   B. Have derrick man check weight of slurry throughout mixing period.
   C. Release plug and wash cement out of rotary hose.
   D. Pump 10 bbl. of water on top of plug.
   E. Displace plug with **rig pump** at maximum rate. Cement truck may also be used to increase the pumping rate.
   F. On cased through completions—reciprocate pipe one full joint until plug is bumped or pipe becomes stuck. (It is not imperative that pipe be landed on bottom, but if it becomes obvious that casing might stick, stroke may be decreased to 20 ft.)
   G. On open-hole completions—reciprocate pipe one full joint until plug is bumped. If pipe becomes loggy before plug bumps, reduce stroke or land pipe as warranted.

N. B. While reciprocating pipe and displacing cement, the actual weight shown on the indicator is not particularly important. The important factor is the **difference** in weight between the upstroke and downstroke as shown on weight indicator. The greater the difference, the greater the frictional drag of the pipe. On a normal job, this difference in weight should remain fairly constant.

6. After plug bumps.
   A. Bleed off pressure rapidly to zero.
   B. Leave cementing head on pipe with **valve open** unless floating equipment fails.
   C. Leave pipe hanging on elevator and do not set table slips.
   D. **Pipe must not be moved for a minimum of 24 hours.**
   E. After WOC for a minimum of 24 hours, land casing and head up. During heading up operations, casing should never be moved.
   F. When installing slips, be sure they are tapped in as far as they will go before slacking off pipe. Set slips with as little downward movement of the casing as possible.

action . . . Shale can be made to slough by rapid borehole pressure changes induced by poor pipe-handling practice. These rapid pressure changes initiate hole damage in two ways:

1. When surges reach the magnitudes involved in this case, (2,000-3,000 psi. in excess of hydrostatic pressure in a 5,000-ft. hole), borehole rock stresses can easily exceed elastic limits, and, even though large fractures might not occur, minute cracks are initiated. Repeated application of such loads then leads to sloughing.

2. Even when stresses are not high enough to form cracks by outward expansion, the natural tendency of the overburden to cause sloughing into the well bore is assisted by rapid pressure changes.

This effect is evident under swabbing conditions where rapid borehole pressure reductions are common. It can also occur during periods normally associated with pressure increases as diagramed in Fig. 1.

Fig. 1 shows a typical pressure cycle while dropping casing and stopping its downward motion rapidly in tight-clearances holes[1]. When this practice is followed, the inertial effect of the fast-moving annular fluid causes pressure to drop sharply. If casing is stopped rapidly enough, pressure can fall below hydrostatic pressure.

This effect, combined with the fact that almost all shales exhibit some acceptance of filtrate, lead to the conditions shown in Figs. 2A and 2B. Fig. 2A shows pressure distribution at the peak portion of pressure surge; the higher borehole pressure has had time to move outward into the surrounding filtrate, and, to a certain extent, creates an artificial pressure envolpe around the immediate well bore. When mud pressure falls off rapidly during brake application, the condition illustrated in Fig. 2B can result. As shown, the artificial pressure created by the long positive portion of the cycle cannot return to the well bore as rapidly as the borehole pressure drops. The sloughing tendency, normally associated only with swabbing reductions, is now evident and can often be even more damaging because of the higher pressures.

It is concluded that for each well a procedure based on a study of dropping rate, hole condition, formation, annular clearance, and equipment should be followed when running casing.

### Reference

1. Clark, E. H., Jr., "Bottom-Hole-Pressure Surges While Running Pipe," ASME Paper No. 54, Pet. 22, also, Petroleum Engineer, January 1955.

*A Report on...*

**GENERAL AMERICAN OIL COMPANY OF TEXAS**

General American Oil Company of Texas has grown at an exceptional rate in over twenty years of profitable operations to become an important domestic petroleum producer. Today, the Company has a book value of $72,900,000 and negligible funded debt, 2,960 net producing oil wells, 103 million barrels of free proven oil reserves, 250 million mcf gas reserves—all located within the United States or Canada. In our opinion, the Company is favorably situated to continue its pattern of growth.

Our report traces certain important factors which have contributed to the Company's progress and which we believe will be of interest to prospective investors in its common stock, now listed on the New York Stock Exchange.

*A copy of this report is available in all our offices on request.*

**Blyth & Co., Inc.**

NEW YORK · SAN FRANCISCO · CHICAGO · LOS ANGELES · SEATTLE · PORTLAND
BOSTON · PHILADELPHIA · PITTSBURGH · CLEVELAND · LOUISVILLE · INDIANAPOLIS
DETROIT · MINNEAPOLIS · SPOKANE · OAKLAND · EUREKA · SACRAMENTO
PASADENA · SAN DIEGO · SAN JOSE · FRESNO · PALO ALTO · OXNARD

# BOOKS

INDUSTRIAL MAINTENANCE PAINTING. By Paul E. Weaver. Published by Paul E. Weaver, 4025 Brady Street, Baton Rouge 5. 189 pp. $5.50.

This volume, a second edition, is written especially for the use of painting and coating supervisors, contractors, painters, and design and maintenance engineers in industrial plants.

The author explains that an effort has been made to shun the technical language and theory used by corrosion engineers, chemists, and others in discussing corrosion and the application of protective coatings.

Seven new chapters are included in this edition that were not present in the initial edition. The chapters deal with specification writing, paint testing, painting-cost estimating, tank-car and vessel painting and lining, proper use and selection of solvents, colors, and painting economics.

In addition, several new tables have been added.

GUIDE TO TECHNICAL REPORTS. By H. Piper and F. Davie. Published by Rinehart & Co., Inc., 232 Madison Ave., New York 16. 83 pp. $1.

This guide has been written for technical students and professional engineers and scientists who want concise, simple instructions for preparing technical reports.

It is the result of a collaboration between a mechanical engineer, with many years of practical experience writing reports for industry, and a teacher of technical reporting procedures to students at the California Institute of Technology.

The guide provides simple directions for converting raw technical data into a finished report. It is divided into three parts and an appendix. The appendix consists of five sample reports, one formal and the other four short, informal reports.

BIOLOGICAL TREATMENT OF SEWAGE AND INDUSTRIAL WASTES. Volume 2. Edited by Brother Joseph McCabe and W. W. Eckenfelder, Jr. Published by Reinhold Publishing Corp., 430 Park Avenue, New York 22. 330 pp. $11.50.

Volume 1, which appeared in 1956 covered the subject of aerobic oxidation including biological flocculation, aeration systems and design of activated sludge plants.

The new Volume 2 deals with anaerobic digestion and solids-liquid separation, including anaerobic treatment, sedimentation and flotation and vacuum filtration, and sludge conditioning. This second volume records the 1957 proceedings of the second conference on biological waste treatment held at Manhattan College, New York. It includes 28 papers contributed by leading authorities and arranged in logical sequence.

PROCESS INSTRUMENTS AND CONTROLS HANDBOOK, Douglas M. Considine, editor. Published by McGraw-Hill Book Co., New York, $19.50.

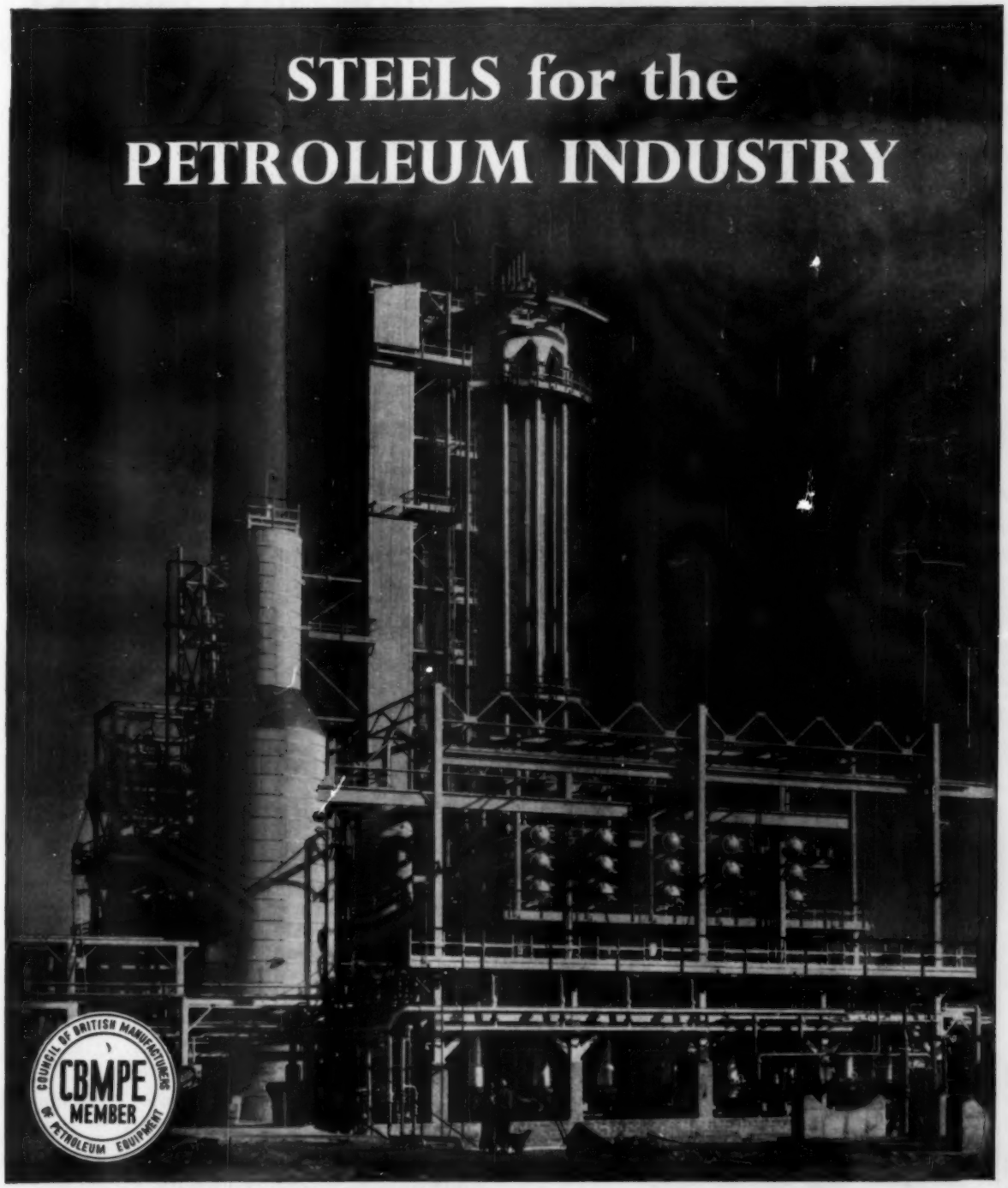
This book is set up in familiar handbook style with 12 sections ranging from measurement through automatic controllers, control valves, fundamentals of automatic controls and reference data.

A 13th section is a glossary of terms used in instrumentation and process control. Both electric-electronic and pneumatic systems are covered.

There are sections on strain gages, industrial weighing equipment, moisture measuring systems, photometric and rheological instrumentation, measurement, and control based on chemical composition.

# THE UNITED STEEL COMPANIES LIMITED, SHEFFIELD, ENGLAND

## STEELS for the PETROLEUM INDUSTRY




*"A Symphony in Steel"—A British Petroleum Company photograph.*

THE UNITED STEEL COMPANIES LIMITED, SHEFFIELD, ENGLAND

APPLEBY-FRODINGHAM STEEL COMPANY • SAMUEL FOX & COMPANY LIMITED • UNITED COKE & CHEMICALS COMPANY LIMITED
STEEL PEECH & TOZER • UNITED STEEL STRUCTURAL COMPANY LIMITED • WORKINGTON IRON & STEEL COMPANY
DISTINGTON ENGINEERING COMPANY LIMITED • OWEN & DYSON LIMITED • YORKSHIRE ENGINE COMPANY LIMITED

THE UNITED STEEL COMPANIES LTD

## As oil-finding and producing costs go up, the industry is taking a longer look at such secondary-recovery methods as

# In situ combustion

SPIRALING COSTS of locating and producing new deposits of liquid fuel in recent years have given rise to a keen reappraisal by the petroleum industry of secondary-recovery methods. In addition to the now-standard techniques of water flooding and gas repressuring, many unusual ideas for the release of unrecoverable oil have been given the critical eye by teams of scientists in production-research laboratories throughout the world.

Studies in the field and the laboratory confirmed a logical suspicion: displacement by water or gas of all low-gravity and many intermediate-gravity crude oils was an extremely slow and ineffective process at low temperatures (those existing in reservoirs which produced such crude oils).

The problem of oil recovery in these cases seemed to warrant two methods of attack, involving either (1) new displacing fluids, or (2) elevated reservoir temperatures. These lines of investigation led to the "new" processes of solvent flooding and thermal recovery.

Over a period of several years a practical procedure for applying heat to a reservoir was developed which appeared to incorporate mechanisms of both solvent and thermal methods. This method has been generally referred to as "in situ combustion."

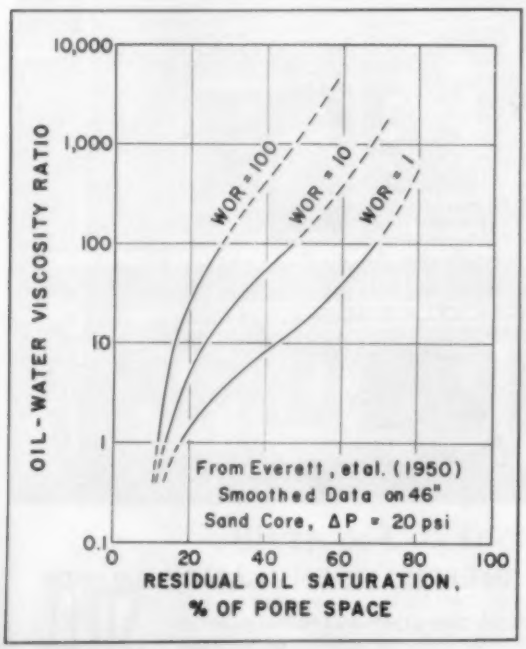
This paper was presented at the eleventh annual TPRC conference at Austin, under the original title, "Recent Progress in Oil Recovery by In Situ Combustion."

BY J. S. McNEIL, JR., AND J. T. MOSS
Magnolia Petroleum Co.

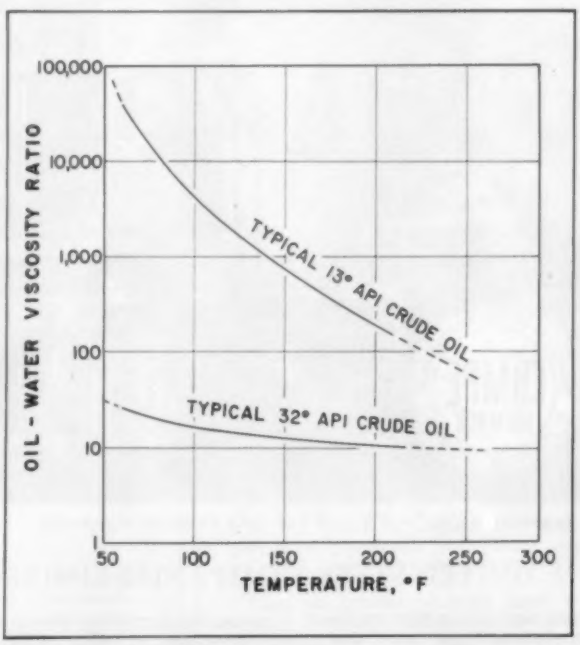
### Early History of Method

The basic idea of this method is not really new. J. O. Lewis, in Bureau of Mines Bulletin 148 issued in 1917, exactly 41 years ago, states: "Of the oil retained in the sand after a well has reached economic exhaustion under customary production methods, part is retained so tightly by capillarity in the finest pores as well as by adhesion to the surface of sand grains that its removal seems to be possible only by using heat or solution."

The idea of an "underground heat-generation process" was introduced in the Soviet Union,[13] and a number of unsuccessful efforts to initiate and




**EFFECT OF VISCOSITY RATIO** on displacement of oil by water. Data have been extrapolated. Fig. 1.




**OIL-WATER VISCOSITY RATIO** as a function of temperature for typical low-gravity and intermediate-gravity crude oils. Fig. 2.

## Get ready for October 12th because...

# Oil Progress Week puts YOU in the Spotlight!

**October 12th to 18th is your week to tell your neighbors that**

*"TODAY—OIL BUILDS for your TOMORROW"*

You have a wonderful Oil Progress Week story to tell in 1958. It's personal and timely. This year's story is an expression of the oil industry's confidence in America's future. Americans everywhere will know that *you*—and everyone else in the oil industry—are looking ahead, building *today* for a better *tomorrow*.

### You'll have plenty of help

The Oil Information Committee has a wealth of attractive, professionally-prepared materials available for your use. There are commercials, films and speeches for radio and television, window posters, exhibits and demonstrations, *plus* a complete mat book filled with advertisements that any oilman can use. And all these materials are *free!*

A great way to get started is to contact your local Oil Information Committee Chairman. He will be happy to help you plan a program that will work for you in your own community.

**Clip this coupon now for complete information about Oil Progress Week.**

**American Petroleum Institute, Dept. G**
**50 W. 50th Street, New York 20, N. Y.**

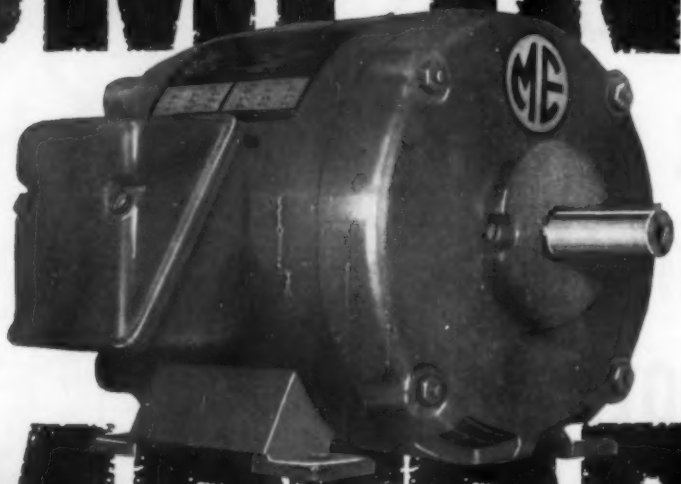
I want to take part in promoting Oil Progress Week in my town. Please send me your FREE booklet explaining Oil Progress Week activities and listing the materials available to me.

NAME_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

# PUMPING MOTORS

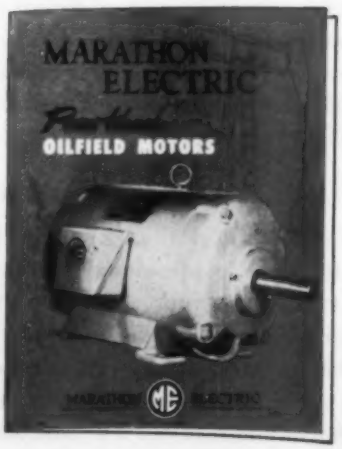


## designed for the oil industry

Every single service requirement for oil field use has been considered in designing Powrthon electric motors. That's why they *really* deliver trouble-free performance throughout their long life.

**Get all the facts *now* on Powrthon Motors!**

Read about their drip-proof, splash-proof, weather-protected enclosures with guarded openings . . . special insulation for oil fields . . . specially engineered cooling system . . guaranteed service factor and other detailed information. For maximum interchangeability, A.C. and new D.C. ratings are available in the same Powrthon frame. Write for Booklet No. SB-176 today. *Marathon Electric Manufacturing Corporation, Wausau, Wisconsin.*

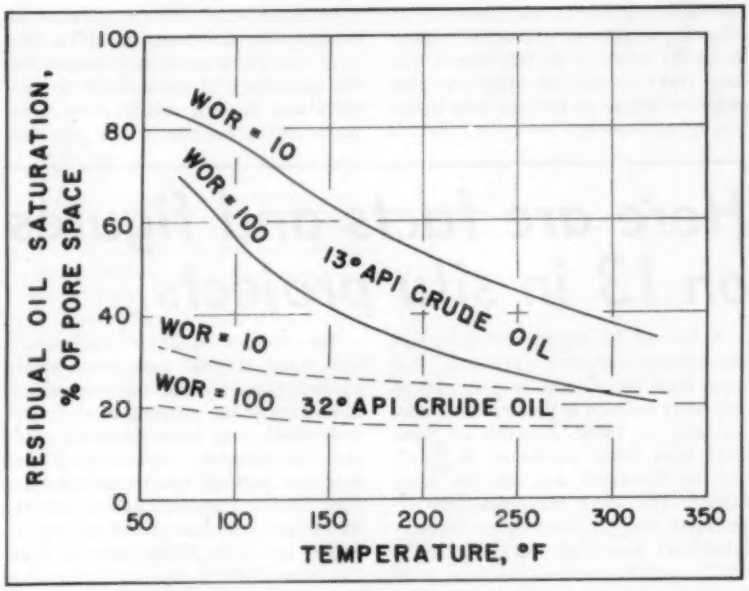



*Motors and generators—that's our business!*

Motors from 1/20 HP to 3500 HP
Generators from 1/2 KW to 2500 KW

# MARATHON ELECTRIC

Home Offices and Factory, Wausau, Wis. • Factories at Erie, Pa. and Earlville, Ill. • Sales Offices in Principal Cities




**TEMPERATURE EFFECT** on displacement of oil by water. Fig. 3.

maintain a moving combustion front are documented[8,9] in the literature of the USSR.

However, only during the past 6 years have properly engineered field tests been conducted, and progress on in situ combustion methods has been rapid since 1952. This was the year that Magnolia and Sinclair engineers, each group working independently only some 300 miles from the other, initiated movement of combustion fronts in pattern-type experiments after several years of preliminary tests.[5-7] Since that time, field experiments have been conducted or planned by a large number of operators. Before discussion of these and other recent developments, however, a review of the general concepts, most of which were established or confirmed in earlier laboratory work, is needed.

### Heating to Increase Recovery

One question that arises in the evaluation of thermal recovery processes is: "How does a change in temperature bring about additional oil recovery?" To answer this question, reference is made to Figs. 1, 2, and 3.

In Fig. 1 the curves represent published data[3] on the displacement of oil by water from an artificially consolidated sandstone core about 4 ft. in length. The data have been smoothed and extrapolated to show the effect of viscosity ratio.

Fig. 2 shows the effect of temperature on the oil-water viscosity ratio for one low-gravity and one intermediate-gravity crude oil. If we now make an assumption that a change in temperature has no gross effect on the displacement mechanism (i.e., that changes caused by alteration of wettability and interfacial tension are small compared to those caused by viscosity reduction) we can combine the viscosity-temperature data of Fig. 2 with the displacement data of Fig. 1.

Fig. 3 is such a combination, illustrating the effect of temperature on residual oil saturation at flowing water-oil ratios of 10 to 1 and 100 to 1. The most interesting features of Fig. 3 are the distinct differences between intermediate-gravity and low-gravity crude oils in residual oil saturation at low temperatures, and the very marked effect of temperature on the efficiency of displacement of the low-gravity crude oil.

It should be added at this point that if temperatures are sufficiently high, leading to complete vaporization of the interstitial liquids, the interface between oil and water might be expected to disappear. Under these conditions, the microscopic displacement efficiency should approach that effected in a miscible-phase process except for the amount of oil converted to coke by cracking.

Recognizing by the above example that the application of heat should greatly increase recovery under some conditions, one is faced with the problem of selecting the most economical method of heating an oil reservoir. A method which uses an inexpensive supply of thermal energy and supplies it to the displacement front with negligible loss in transit should, of course, be most effective.

The only way of fulfilling both of these conditions, as far as we know, is to burn a small portion of the in-place oil and thus create a moving combustion front. Thus, the in situ combustion recovery process is a logical culmination of research in secondary recovery and appears to be a reasonable solution to the problem of recovery from reservoirs containing heavy crude oils.

### In Situ Combustion

The in situ combustion process is, of course, much more complicated than mere displacement of oil by water. While our understanding of detailed mechanisms of the combustion and displacement has improved greatly as the result of intensive study during the last 10 years, many questions still remain unanswered.

The process can be described in a qualitative way as we see it today by reference to the two cross-sections in Fig. 4.

After injecting air for a relatively short time to establish a continuous gas phase between the injection and production wells, the formation is ignited at the injection well. Several methods of ignition have been used in the various field trials of the combustion process.

Briefly, these are by downhole electrical heaters, downhole gas burners, and chemical methods in which a readily oxidizable chemical such as phosphorus is spotted in the well bore. The use of a mixture of steam, exhaust combustion gases, and free oxygen has also proved successful.[4,14]

During continuous air injection after ignition has been accomplished, a slowly moving burning front advances toward the production wells. The crude oil immediately ahead of the high-temperature burning front is carbonized to produce a cokelike deposit on the sand. This deposit constitutes the principal fuel for the process.

Left behind the burning front is hot, clean sand which is effectively utilized to heat the injected air before it reaches the burning zone. Movement of a continuous burning front, by its very nature, results in virtually complete removal of all reservoir liquids from that part of the formation swept by the front. As might be expected, continuous propagation of the burning front in all directions appears to be the most critical part of the operation.

With air as the oxidizing agent and with fuel concentrations of 1 to 2 wt. % of the reservoir rock, combustion-zone temperatures usually reach 600° to 1,200° F. In addition to the transfer of heat from the combustion front by conduction, an appreciable amount of heat is carried forward into

the oil-sand region by the water of combustion and by the formation water vaporized at the burning front.

The resulting steam, upon condensation, provides a hot-water sweeping action. Ahead of this zone, the light hydrocarbons evolved by distillation and mild cracking of the oil at the combustion front blend with formation oil to increase its mobility.

The creation of an oil bank downstream of the burning front is probably next in importance to the maintenance of combustion. This bank represents a zone of high oil saturation and results primarily from the displacement by the burning front of oil from the region swept by the combustion front.

The bank tends to grow in length, and as it approaches a production well, a substantial increase in the oil-production rate occurs. All of these mechanisms function simultaneously and complement one another. Consequently, oil is produced at not only greatly increased rates but also in greater total amounts.

To mention some of the possible variations to the basic process described above, Sinclair in its early field tests[5] injected mixtures of air, natural gas, and exhaust gases. Worthington and Forest Oil Co. reported[4 14] the injection of steam, exhaust combustion gases, and free oxygen, and Ramey, in a discussion[5] of Sinclair's field test, listed other possible injection mixtures. All of these processes, however, are quite similar and depend, basically, on moving a high-temperature zone through the formation.

Experiments with inert gases along with highly complex heat-transfer calculations indicate that breakthrough of the burning front into the production wells is not necessary to achieve high oil recovery. Traverse of the burning front over about three-quarters of the distance toward the production wells might be sufficient; subsequently, by conduction alone, elevated temperatures would reach the remaining distance.

From this method of "partial burnout," oil production might continue for a period of from several months to more than a year after combustion is stopped. Injection of exhaust combustion gases, water, or other fluid heat carrier would, of course, increase the rate of heat transfer to the unburned region.

### Operating Variables

The in situ combustion drive has been shown to have certain basic similarities to other types of drive mechanisms such as gas injection or water flooding. The unusual aspect of the combustion drive is the presence of a moving heat front. To achieve maximum oil recovery by this means, the heat front should be carefully controlled both as to its rate and direction of movement.

Unfortunately, efforts to exercise control over the direction of burning have not been uniformly successful, but knowledge of the controlling variables has become much more complete and systematic in the past few

# Here are facts and figures on 13 in situ projects

A list of 13 recent and proposed combustion-recovery projects that have been mentioned in publications and news releases is presented chronologically in Table 1. First of these field tests were conducted in 1952, one by Sinclair,[5] and one by Magnolia.[7] The 1952 Magnolia field experiment was preceded by preliminary laboratory and field work starting in 1947; Sinclair initiated its field work in 1948.

Our second test, the Oklahoma five-spot experiment,[6] was initiated in 1953. In the same year, Worthington and Forest Oil started a test in the Parker pool in Clark County, Illinois.[4 14] Standard Oil of California conducted its early work in the Irvine-Furnace field of Kentucky[18 19] in 1954.

The results of these preliminary tests were, for the most part, highly encouraging; based on the information gained about the process, other larger-scale field tests were designed. Sinclair is currently operating in the northern part of the Humboldt-Chanute field of Kansas,[16] and California Research Corp. has completed an extensive test in the Midway-Sunset field, California.[19 21]

The results and operating experience gained from Magnolia's three-spot and five-spot experiments were utilized in the design of the South Belridge test[17 20 21] operated by our West Coast affiliate, General Petroleum. This test, recently concluded, was conducted in the rich but low productivity 700-ft.-deep Tulare sand in Kern County, California.

## Table 1—Some Recent

| Date[1] | Operator and location— |
|---|---|
| 1952 | Sinclair—Delaware-Childers field, Nowata County, Oklahoma |
| 1952 | Magnolia—West Loco field, Jefferson County, Oklahoma |
| 1953 | Magnolia—West Loco field, Jefferson County, Oklahoma |
| 1953 | Worthington-Forest Oil—Parker field, Clark County, Illinois |
| 1954 | Cal. Research, California Co.—Irvine-Furnace field, Estill County, Kentucky |
| 1955[3] | Sinclair—Spraberry field,* Texas |
| 1956 | Sinclair—Humboldt-Chanute field, Allen County, Kansas |
| 1956 | General Petroleum[5]—South Belridge field, Kern County, California |
| 1956 | Cal. Research—Midway-Sunset field, Kern County, California |
| 1956 | Richfield—Sisar-Silverthread field, Ventura County, California |
| 1957[6] | Independent (Houston)—Camp Hill field, Anderson County, Texas |
| Proposed | Ohio—Uinta County, Utah |
| Proposed | Creole—(Venezuela)* |

*Specific data not released; values given are from published field data.

1. Date of initiation of specific test, where available; otherwise, date of publication.

2. Forty feet between injection well and most distant production well.

3. Failed to initiate a moving combustion front.

years, and progress toward better control of these aspects of the process can be expected to continue.

The role of laboratory work in systematizing knowledge of operating variables is difficult to overemphasize. Just as laboratory flood pot tests are useful in evaluating and studying the effects of water-flood operations, laboratory combustion-tube studies have been found to give much useful information for in situ combustion.

The application of laboratory experimentation was discussed briefly in one of our earlier papers[7] on in situ combustion. More recently Martin and coworkers at Continental[10] read a paper showing how tube experiments

The widespread interest in the combustion process was evidenced by the number of companies participating in the South Belridge test (see footnote 5, Table 1). Once the data from this test have been properly interpreted, the economics of application of the process to heavy oil sands in California should be more firmly established.

Geographically, in situ combustion has not been limited to any one section of the country. At present, three, and possibly four, thermal recovery projects are operating or have been completed in California. Some of these are not listed in Table 1 because they have not to our knowledge been publicly announced. Interest in California centers mainly around the numerous heavy oil deposits found in that state. In the Mid-Continent and eastern areas, three tests have been located in Oklahoma; one in Illinois; one in New York; possibly two in shallow oil deposits along the Missouri-Kansas border; one test in Kansas; and one in Kentucky. In Texas, Sinclair made a preliminary test in the Spraberry field,[2] and, currently, independent Houston operators are making tests of an exploratory nature in the shallow oil sands of Anderson County in East Texas.[24]

**GEOGRAPHIC LOCATION** of proposed, active, and completed in situ combustion oil-recovery projects in the United States.

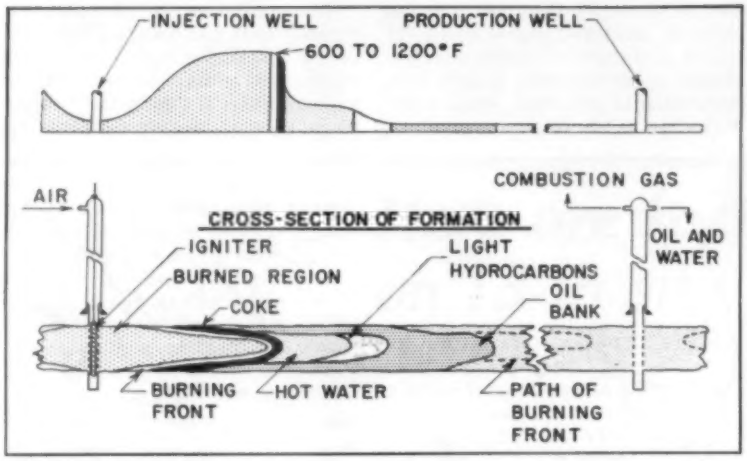
## Field Tests of In Situ Combustion

| Reservoir properties | | | | | | Test characteristics | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Formation | Depth (ft.) | Thickness (ft.) | Porosity (%) | Oil saturation (%) | Oil gravity, °API | Well pattern | Pattern size, acres | Ignition method | Injected gas | Reference |
| Bartlesville sandstone | 600 | 26 | 21 | 32 | 36 | 7-well (inverted) | 5.2 | Downhole gas burner | Air, product gas, natural gas | 5 |
| Pontotoc sand | 180 | 20 | 29 | 60 | 18 | 3-well (in line) | (2) | Electrical | Air | 7 |
| Pontotoc sand | 180 | 20 | 29 | 60 | 18 | 5-well (inverted) | 0.07 | Electrical | Air | 6 |
| Pennsylvania sand | 275 | 35 | 21 | 42 | 26 | 5-well (inverted) | 0.28 | Injection gases heated at surface | Steam, air, combustion gas | 4, 14 |
| Corniferous limestone | 70 to 1,200* | 0-61* | (*) | (*) | 30-36* | (*) | (*) | (*) | (*) | 12, 18, 19 |
| | 8,000* | 10-165* | 12-18* | (*) | 32-42* | (*) | (*) | (*) | (*) | 2 |
| Bartlesville sandstone | 600 | 23* | 20 | (*) | 25 | 3:1 line drive | (4) | (*) | (*) | 16 |
| Tulare sand | 700 | (*) | (*) | (*) | 13 | 5-well (inverted) | 2.5 | (*) | Air | 17, 20, 21 |
| (*) | 2,000 | (*) | (*) | (*) | 20 | 4-well (inverted) | 1.2 | Downhole gas burner | Air | 19, 21 |
| Miocene sandstone | 1,000* | (*) | (*) | (*) | 11-30* | (*) | (*) | (*) | Gas and air | 22, 23 |
| Carizzo sand | 500* | 50-100* | 35* | (*) | 20* | (*) | (*) | (*) | Heated air | 24 |
| Asphalt Ridge | (*) | (*) | (*) | (*) | (*) | (*) | (*) | (*) | (*) | 26 |
| (*) | (*) | (*) | (*) | (*) | (*) | (*) | (*) | (*) | (*) | 25 |

4. Two or more rows of input wells about 150 ft. apart, spaced 400-450 ft. from rows of production wells.

5. Participating companies: Continental, Esso Research & Engineering, Gulf, Honolulu, Ohio, Shell Development, Sunray-Mid-Continent, Texas, Tidewater, Union, Chanslor-Western.

6. Whether ignition of oil sand is planned in this test has not been announced.




**MECHANISMS** of the in situ combustion process showing temperature distribution. **Fig. 4.**

are used in studying process variables associated with the combustion drive. The potentiometric model is another laboratory tool which for a number of years has been useful to reservoir engineers. This device has helped to clarify some important design considerations for specific pattern geometries by permitting the application of laboratory results derived from linear flow systems to field flow systems.

**Fuel consumption . . .** One of the most important results obtained from laboratory experiments is the indication of the amount of residual fuel deposited on the sand by the oil. These data are usually expressed as pounds of fuel per 100 lb. of sand and then converted to pounds per cubic foot of formation by multiplying by the bulk density of the formation.

We have experimented with a number of different crude oils and have found that the fuel deposited usually ranges from 1 to 2 lb. per 100 lb. of sand. Generally, the heavy, viscous oils seem to leave higher fuel deposits than do light, high-gravity oils. Some of the factors which may affect the fuel-deposition characteristics of a crude oil are burning-front temperature and rate of advance, oil viscosity, oil composition, pressure gradient, composition of oxidizing gas, and specific surface area of the formation rock.

**Oxygen utilization and air requirements . . .** The in situ combustion process is unlike common industrial combustion processes (such as those used for generation of power) in technical as well as in economic principle. In most industrial processes the combustion air is essentially free, and the cost of fuel is the significant economic factor. Conversely, in underground combustion, where the fuel is an almost worthless carbonaceous residue left by crude-oil vaporization and cracking, the primary operating cost is the cost of compressing air.

An important variable affecting air requirement for a given oil sand is the efficiency of oxygen utilization. Often, laboratory tests conducted at high air - flux rates to insure active combustion are characterized by poor oxygen utilization, or apparently poor combustion efficiency. In the field, where the flow of air to the burning front is slower than in most laboratory tests, at least when the combustion front is at a considerable distance from the injection well, better utilization of oxygen might be expected. Indeed, a typical analysis of injected and produced gas from Worthington's test indicated oxygen utilization of more than 90% during a period of active combustion, even when the injected gas was low in oxygen; most of the oxygen showed up in the produced gas as carbon dioxide. At the same injection rate, a gas richer in oxygen would be expected to cause a higher burning-front temperature and presumably even better oxygen utilization.

The air used for combustion of 1 cu. ft. of formation, designated as the unit air requirement, can be estimated from results of laboratory combustion studies. Since this quantity depends on combustion efficiency and cannot be expected to be the same in the field, where geometry and flow rate are quite different, it is convenient to subtract excess air from the total requirements and express the air requirement as that needed for 100% oxygen utilization. For many oils, this figure has been found to range from about 200 to 400 standard cu. ft. per 1 cu. ft. of oil sand.

**Areal and vertical sweep . . .** Aronofsky and Ramey[1] have shown that the areal-sweep efficiency in a frontal-displacement process varies with the mobility ratio (ratio of mobility of displacing fluid to that of displaced fluid). Considering the process of in situ combustion, the mobility of air behind the burning front is very high compared to the mobility of gases in the reservoir ahead of the burning front. The ratio of these mobilities, therefore, approaches infinity. For developed five-spot operations the areal sweep of the burning front at breakthrough into production wells is about 62% of the pattern area, assuming uniform permeability within the pattern and infinite mobility ratio.

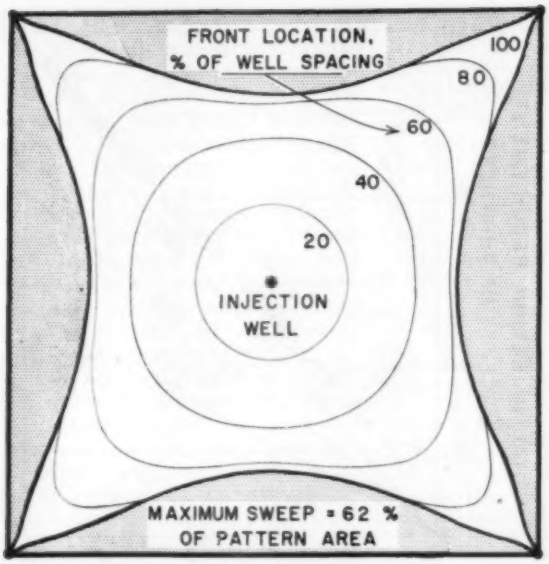
Fig. 5 shows the configuration of the burning front at various locations as it moves outward from the injection well. These locations are conveniently expressed as a per cent of the injection to production well spacing.

In addition to limitations on areal sweep, such factors as gravitational effects, quenching caused by heat losses to over and underlying strata, and incomplete ignition of the sand face at the injection well may limit the vertical extent of a burning front. For example, in Magnolia's three-well Oklahoma test burning was confined to the upper 8 ft. of the 20-ft. oil sand.

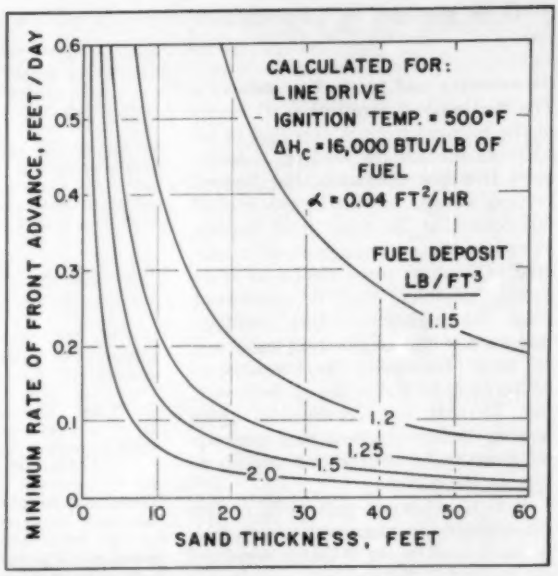
At present, no general conclusion can be drawn concerning vertical sweep. Conventional techniques used for predicting sweep in two dimensions appear to be inapplicable, and novel approaches will undoubtedly be required. Since vertical sweep is a variable perhaps equal in importance to areal sweep, research on methods to establish reliable design information appears to be a fruitful field.

**Minimum rate of burning front advance . . .** A variable of major importance in the combustion process is the lower limit of frontal advance rate that can be maintained without quenching of the flame (active combustion). Knowledge of this quantity would be useful in the design of combustion operations and in evaluating economics of the process, for it establishes the minimum air-injection rate for propagation of a burning front and fixes the limits on burned area for a specific type of recovery pattern and for specific compressor capacity.

The minimum RBFA (rate of burning front advance) naturally depends on the amount of fuel deposited and, as a result, may be considered a dependent rather than a primary variable. The minimum RBFA also de-




**AREAL SWEEP** diagram for developed five-spot well pattern. Fig. 5.




**MINIMUM** burning rate in an ideal in situ combustion system. Fig. 6.

pends on a number of other factors; the extreme ranges that may be expected can be illustrated in a qualitative way by reference to an ideal system.

Consider a plane-front burning a hypothetical fuel (with ignition temperature of 500° F. and heat of combustion equal to 16,000 B.t.u. per lb.) and moving linearly in a homogeneous reservoir of limited thickness but of large areal extent. Neglect the heat-carrying effects of fluids and assume that heat is lost by conduction above, below and ahead of the front. Now define the minimum RBFA as that rate necessary to keep the temperature at all points along the plane of combustion above the ignition temperature of the fuel.

Fig. 6 shows results of theoretical heat-transfer calculations based on this simplified model. Note that the minimum RBFA is not only a function of fuel deposit but also depends strongly on formation thickness. Changes in properties of the fuel deposit also appear to have very great effects on the minimum RBFA. For example, with 1.5 lb. per cu. ft. of the fuel selected, the minimum RBFA in a sand 10 ft. in thickness was calculated to be 0.14 ft. per day. With a more active fuel (ignition temperature of 300° F. and heat of combustion equal to 20,000 B.t.u. per lb.) calculations of the same type show a minimum RBFA only about one-sixth of this value.

It is reemphasized that the examples cited above are illustrative only. The absolute values of RBFA do not conform to field experience and should not be used as design figures. More detailed information on the mechanism and rate of combustion in porous rock will be needed to delineate this variable properly.

### Design Factors

With adequate knowledge of the operating variables peculiar to the in situ combustion process, it is possible to investigate the basic design considerations which will eventually establish economics for a specific field operation. It is to be noted that all of these factors depend on the operating variables discussed above.

Those concerned with rate are also affected by variables having to do with the multiphase flow conditions downstream from the combustion front; these are not sufficiently understood at present to include in this discussion. However, the work of Wilson, et al.[13] has led to an interesting, though necessarily simplified, attack on this highly complex problem.

**Total air required . . .** The sand swept for any front location can readily be obtained by planimetering the swept area enclosed by the burning front (shown in Fig. 5) and converting to field units of measure. Multiplying this area by net sand thickness and the unit air requirement (standard cubic feet of air per cubic foot of formation), gives an estimate of the total air which must be injected to advance the front to a given location.

Fig. 7 shows the total quantity of air required for breakthrough in developed, five-spot combustion operations as a function of pattern size for different unit air requirements. Note that this is exactly the amount of air required to burn the total sand thickness to breakthrough. For the real case, where limited vertical sweep is obtained, less air will be required at the time of breakthrough of the front to producing wells because of the preferential flow through the burned zone. The air requirements thus obtained represent a safe upper limit; a better answer must await new information on vertical sweep.

**Air injection rate . . .** To size the compressor installation for movement of an underground combustion front in a given reservoir, air injection rate must be known. Methods do not exist at present to fix an optimum injection rate, even for a specific operation. However, if a reasonable schedule for rate of burning front advance (RBFA) can be set up, the air injection rate can be calculated from potentiometric-model data of the type shown in Fig. 5. This is possible because the air flux (expressed as SCFH/sq. ft. of frontal area) is proportional to rate of burning front advance,[11] the proportionality constant depending on combustion efficiency and fuel consumption.

What constitutes a "reasonable" schedule for the RBFA is a subject of some conjecture. A lower limit has already been discussed. An upper limit on RBFA probably exists for any specific field case depending on permissible injection pressure (overburden pressure), well productivity, or an economic balance between capital investment (in the compressors) and rate of

return as governed by oil-production rate.

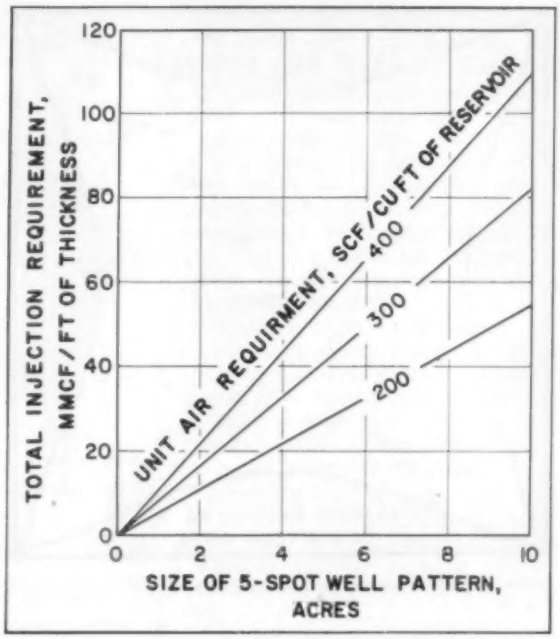
**Oil recovery and production rate . . .** The maximum theoretical areal sweep of the burning front is expected to be 62% of the pattern area in a developed five-spot operation, but limited vertical sweep, as well as the loss of oil consumed as fuel, tend further to reduce the percentage of oil recovered. Offsetting these effects to some extent, however, heat is transferred from the high-temperature combustion zone to the neighboring unburned oil sand. Increasing the temperature of the oil sand makes the oil more mobile so that hot combustion gases leaving the burning front tend to sweep additional oil from the unburned portion of the pattern.

It is to be noted that 80% of the oil originally in place was reported to be recovered in the Worthington-Forest oil test.[14] While such a high recovery efficiency is not presently anticipated for all combustion operations, improved knowledge of the process may lead to higher areal and vertical sweep of the burning front. It is also quite probable that improved methods for transferring heat to, and displacing oil from, the unburned regions of the reservoir will likely be developed as more field experience with this new process is gained.

Production rates associated with the combustion process are frequently several times higher than the normal primary production rate of field wells. This is especially true for heavy oils where the high viscosity of the produced oil greatly impedes primary production rates. After combustion is initiated, as the burning front reaches the vicinity of the producing wells, high temperatures ahead of the front reduce the viscosity of the oil. This results in increased oil-production rates.

The following example illustrates how oil is displaced by the burning front. Assuming steady-state conditions, the rate of oil displaced equals the production rate. Consider a burning front, 30 ft. in vertical thickness, moving radially outward from an injection well at a velocity of 0.3 ft. per day. For developed five-spot operations, the theoretical oil production rate is about 170 bbl. per day when the burning front is located 100 ft. from the injection well (assuming that the amount of recoverable oil in place is 1,300 bbl. per acre-ft.).

Theoretical oil-producing rates then vary directly with: (1) velocity of the burning front, (2) perimeter distance of the front, (3) thickness of burned sand, and (4) the recoverable oil content of the formation. Actual production rates could be expected to correspond closely to the theoretical rate but would also depend upon such factors as oil viscosity, sand thickness, effective permeability to oil, and other parameters that enter into the conventional flow equations.




**TOTAL** air supply per well pattern for a maximum sweep of 62% for a developed five-spot in situ combustion operation. Fig. 7.

### Operating Problems

Our field experience has shown that certain special problems of an operational nature are to be expected in combustion operations. Many of these problems exist primarily because of the relative newness of the process and will undoubtedly be solved as more field experience is gained. Some problems, such as possible high-temperature well damage, are peculiar to the thermal process and warrant special consideration.

It has previously been mentioned that breakthrough of the burning front to a production well may not be necessary to achieve high oil recovery. This method of operation would circumvent excessively high downhole temperatures at the production wells. Still other methods of temperature control are readily suggested from the common principles of fire fighting: remove one of the three ingredients necessary for combustion (fuel, air, or heat).

For example, it may be possible to remove the supply of both fuel and air by shutting in a well. Unless heat is removed, however, putting the well back on production again would cause reignition. To prevent reignition, the temperature around the well bore can be brought below the spontaneous ignition temperature of the crude oil by circulation of a heat-carrying fluid (oil, water, or gas). After the well is again on production, the circulation of the heat carrier can be maintained at a rate sufficient to keep well-bore temperatures in the desired range (below ignition temperature of produced oil and gas but hot enough to maintain high productivity).

Other more common operating difficulties such as corrosion and sanding problems may be aggravated somewhat by the high production rates associated with underground combustion. It now appears that problems of this type can be successfully overcome by the proper application of presently developed oil-field techniques.

A combustion project will probably soon be started in the Rocky Mountain region in Wyoming, and Sohio[26] has proposed a test in the Asphalt Ridge section of Utah. In Canada, thermal recovery techniques have been considered for several years as a possible means of producing the Athabaska tar sands, and it is understood that some preliminary testing was carried out there during this last winter.

Oil producers in South America are also apparently quite interested in applying thermal methods to some of their reservoirs. To date, tests have been considered in Venezuela by at least three different companies.

In summary, our present scoreboard on combustion field work reads: seven test projects or field experiments terminated; nine projects under way, and four or more projects in various stages of planning.

### The Next 25 Years

Developments in thermal recovery have come so rapidly during recent years that predictions concerning the distant future seem fraught with uncertainty. However, having seen the in situ combustion process advance from infancy to the current state of knowledge in only 1 decade, we freely predict that the elapse of two or three times this period will surely be sufficient to fix its position and usefulness among available secondary-recovery methods. The ultimate measure will be economics: the weighing of the cost against the value of the oil made available as compared with other applicable techniques.

This necessary economic comparison requires more knowledge than is now available on the performance of water flooding, miscible-phase displacement, in situ combustion, and possibly other processes of potential merit. It is our own opinion that the areas of economic application of the various secondary-recovery methods will be found to overlap considerably for the intermediate-gravity crude oils.

However, as time passes the increasing value of the oil left in the ground should tip the scale toward those recovery processes which are most efficient in terms of ultimate oil recovery. We feel that the in situ combustion process, properly engineered in those fields to which it is applicable, is perhaps the most effective mechanism now available for the separation of oil from reservoir rock.

While oil recovery from the swept region, as observed in laboratory tests, is less than the 100% often quoted for miscible flooding (because of the combustion of a part of the heavier oil fractions as fuel) additional oil is obtained in combustion from unswept regions bypassed because of fingering of the combustion front. This "thermal drive" mechanism has no counterpart in nonthermal displacement methods.

Concerning the applicability of subsurface combustion specifically to Texas oil fields, a number of shallow, nonproductive reservoirs producing low and intermediate-gravity crudes are known to exist in this state. An example which has resisted exploitation by conventional means and which is now under serious study by TPRC and independent operators[24] is the extensive Carrizo-Wilcox sand in Anderson County.

### References


1. Aronofsky, J. S., and Ramey, H. J., Jr., "Mobility Ratio—Its Influence on Injection or Production Histories in Five-Spot Water Flood," J. Pet. Tech. 8, 205 (1956).
2. Enright, R. J., "Spraberry Finally Pays Off for Some," The Oil and Gas Journal, 55, 90 (Sept. 2, 1957).
3. Everett, J. P., et al., "Liquid-Liquid Displacement in Porous Media as Affected by the Liquid-Liquid Viscosity Ratio and Liquid-Liquid Miscibility," Trans. AIME 189, 215 (1950).
4. Garbus, R., "New Idea in Thermal Oil Recovery," Pet. Engr. 28, B83 (April 1956).
5. Grant, B. F., and Szasz, S. E., "Development of Underground Heat Wave for Oil Recovery," Trans. AIME 201, 108 (1954).
6. Koch, R. L., Gleason, J. F., Jr., and Boston, W. G., "In Situ Combustion Field-Tested Again," The Oil and Gas Journal, 53, 102 (Dec. 6, 1954).
7. Kuhn, C. S., and Koch, R. L., "In Situ Combustion—Newest Method of Increasing Oil Recovery," The Oil and Gas Journal, 52, 92 (Aug. 10, 1953).
8. Lapuk, B. B., "Results of the Investigations of Subterranean Gasification of Oil Sands," Azerbaidzhanskoe Neftvanoe Khozyaistvo 1939 (No. 2), 31-36 (1939).
9. Lapuk, B. B., "Heat Treatment of Oil Sands to Increase the Recovery of Oil," Azerbaidzhanskoe Neftyanoe Khozyaistvo 1939 (No. 12) 10-15 (1939).
10. Martin, W. H., Alexander, J. D., and Dew, J. N., "Process Variables of In Situ Combustion," J. Pet. Tech. 10, 23 (Feb. 1958).
11. Ramey, H. J., Jr., and Nabor, G. W., "A Blotter-Type Electrolytic-Model Determination of Areal Sweeps in Oil Recovery by In Situ Combustion," J. Pet. Tech. 6, 35 (1954).
12. Shaw, E. W., "The Irvine Oil Field, Estill County, Kentucky," USGS Bulletin No. 661, 141-191 (1917).
13. Sheinman, A. B., et al., "Gasification of Crude Oil in Reservoir Sands," Pet. Engr., Part 1: 10, 27 (Dec. 1938), Part 2: 10, 91 (Feb. 1939).
14. Walter, H., "Application of Heat for Recovery of Oil: Field Test Results and Possibility of Profitable Operation," J. Pet. Tech. 9, 16 (1957).
15. Wilson, L. A., et al., "Fluid Dynamics During an Underground Combustion Process," 32nd annual fall meeting, Soc. of Pet. Engr., AIME, Paper No. 913-G (1957).
16. Anon., "New Oil-Recovery Method," The Oil and Gas Journal, 53, 81 (April 11, 1955).
17. Anon., "Fire Flood Set," The Oil and Gas Journal, 54, 132 (July 25, 1955).
18. Anon., "Thermal Recovery Tested," Chem. and Engr. News 33, 4406 (Oct. 17, 1955).
19. Anon., "Thermal Recovery Gets a Payoff Test in California," Pet. Week 3, 14 (July 27, 1956).
20. Anon., "Trial by Fire," Chem. and Engr. News 34, 3864 (Aug. 13, 1956).
21. Anon., "Oil Recovery by Fire Flood," Oil Forum 10, 387 (Nov. 1956).
22. Anon., Annual Review of California Crude-Oil Production 1956, Conserv. Com. of Calif. Oil Prod., p. 53 (1957).
23. Anon., Pet. Wk., 4, 21 (Mar. 22, 1957).
24. Anon., Dallas Times-Herald, Aug. 11, 1957).
25. Anon., Pet. Wk., 5, 56 (Nov. 16, 1957).
26. Anon., Pet. Wk., 5, 34 (Dec. 13, 1957).

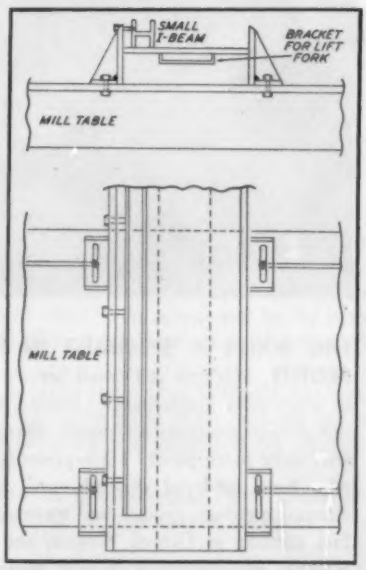

# Cradle holds tube bundles

A CRADLE made from an I-beam can be used to securely hold tube bundles on horizontal boring mills. The amount of machine time and the number of rejects can be reduced this way. This is because the spring and bounce normally experienced when the bundle rests on the mill table itself will be eliminated.

The I-beam is installed on the table so that it rests on its side, becoming for appearances' sake an H-beam. Four slotted plates are welded to the beam and are used to fasten it to the boring mill table. The slots enable the machinist to set up and align the job quickly and securely.

The tube bundle rests in the cradle formed by the upper half of the "H". Long tube bundles are supported on one end by an overhead crane. This combination makes it possible to conveniently move the tube bundle as desired without getting the job out of alignment. The spring and bounce is also eliminated, thereby insuring a smoothly finished gasket surface.

To take care of small-sized tube bundles, a smaller I-beam is placed in the large cradle and secured to one side by a series of bolts. A wide range of tube bundles can be handled by this combination. A fork-lift truck is used




to move the heavy I-beam, and a bracket is welded to the bottom side of the "H" cross member to facilitate this type of handling.

Method suggested by Daniel L. Dunn, Jr., machinist, Baytown, Tex.; courtesy Humble Oil & Refining Co.

**THIS MAN'S A SPECIALIST IN PROTECTING YOUR PROFITS.** His title is Dowell Service Engineer. His job—to study your maintenance cleaning problems, recommend the proper solutions and apply chemical solvents to help you make more profit. He represents a team of specialists who have rendered old-fashioned all other methods of cleaning product, process and steam generating equipment. His method is Dowell Service, the modern way—using solvents—to remove scale and sludge from all kinds of metal equipment, tanks, piping and lines.

Specifically: one processor had been performing his own turnaround service—using mechanical methods—at an annual cost of $315,000. The Dowell Service Engineer and his team performed the same service in 1/10 of the time at a cost of $2300. The savings in downtime alone amounted to $210,000.

If your maintenance and operating engineers do not know the profit possibilities with Dowell Service, ask them to get the facts for you. For specific information on how chemical cleaning can help your plant to greater profits, call the Dowell office nearest you. DOWELL—A SERVICE DIVISION OF THE DOW CHEMICAL COMPANY. Headquarters and research center, Tulsa, Oklahoma, with 165 offices and stations to serve you.

*chemical cleaning services for industry* DOWELL

Refiners are beginning to rely on

# Mass spectrometry for analysis

IN ONLY 14 short years the extremely sensitive mass spectrometer has become a dependable and widely used analytical tool in the oil industry, making possible in minutes analyses which formerly took hours and even days.

The mass spectrometer, as an analytical and research instrument, is a relative newcomer to the petroleum and petrochemical industries. The first commercial instrument was installed for analytical work in a refinery in 1942.

Specific uses of mass spectrometers in petroleum refining and petrochemicals are as varied as the processes themselves. Research investigations, control analyses, complex mixture analyses, exploratory analyses, and purity determinations are everyday general tasks for the instruments.

### Petroleum Waxes

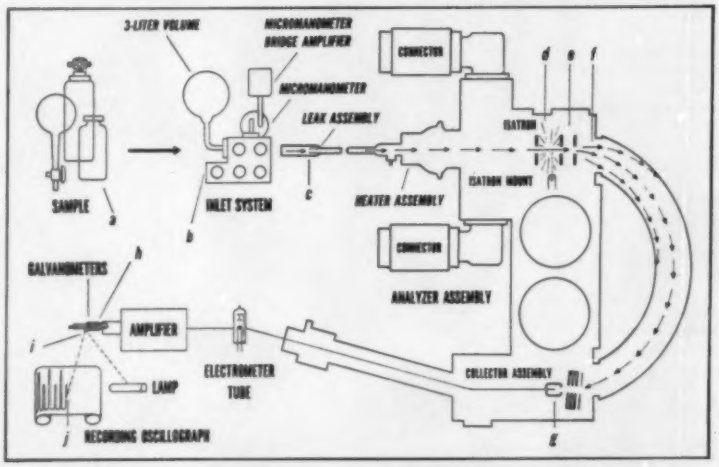
The properties of petroleum wax are affected by its detailed composition. All information reported has indicated that paraffin wax consists largely of "normal" paraffins, but evidence of the presence of other structures has always been found.

Dr. R. T. Edwards of Socony Mobil Laboratories has obtained a relationship between composition and tensile strength of paraffin waxes. Tensile strength is one of the properties most frequently used as an indicator of wax quality.

**Spectrometer used . . .** Mass spectrometer has been modified for high mass use by the Research and Development Department at Paulsboro.

A glass inlet system was built for operation at 350° C. The ion chamber is maintained near 270° C. This yields an m/e 43/58 ratio of 9.6 for n-butane. Instrument operating conditions are chosen to provide the optimum working compromise between parent peak sensitivity, beam width (resolution), and interference.

The computing method uses selected ion fragments to characterize hydrocarbon types, and parent-molecule ions to establish molecular weight distribution. A 3-ethyl-paraffin structure is assumed to characterize isoparaffins to provide the normal and isoparaffin split. Variations in both pattern coefficient and sensitivity with molecular weight are taken into account by interpolation and/or extrapolation from data provided by the pure compounds presently available.




## How the mass spectrometer works . . .

**a.** A sample of the unknown substance is stored in a small container at relatively low pressures, usually in the vapor phase.

**b.** The molecules are introduced through a series of special valves called the inlet system.

**c.** The conglomerate mixture of molecules passes through a restriction called a gold leak. The tiny openings allow only a limited number of molecules to pass.

**d.** In the ionization chamber, called the Isatron, a much higher vaccum is maintained. Here the molecules are bombarded with a stream of electrons from a heated filament. Some become positively charged ions, others are fragmented and positively charged.

**e.** Ions thus formed leave the Isatron chamber through a narrow slit. They are next accelerated to a high velocity by a strong electrostatic field, and pass through a second slit.

**f.** A magnetic field, parallel to the slits, diverts the fast-moving ions into circular paths, the radius of which is proportional to the mass and velocity of the ion. Thus, the single beam is split into individual beams.

**g.** Sorted in this manner, ions of a given mass pass through resolving slits and strike a collector 180° away from their starting point. The charges given up to the collector are amplified by an electrometer tube.

**h.** Having now been translated into an electric signal, the results are amplified and fed to a bank of five galvanometers, each set for a different sensitivity.

**i.** A tiny beam of light reflected from each galvanometer mirror is photographed on a moving roll of sensitive paper in the oscillograph.

**j.** Thus, the complete mass spectrum is obtained, focusing the separated ion beams successively on the collector by varying the ion-accelerating voltage. As each beam sweeps across the collector, its intensity is recorded on the moving paper.

BY W. L. NELSON, Technical Editor and Petroleum Consultant



# Shift-labor requirements from the literature

| | (Men per 8-hour shift) Operating | Supervision | Maintenance† | Laboratory | References |
|---|---|---|---|---|---|
| Absorption | 3.0 | 0.7 | 1.7 | ..... | 33 |
| Alkylation | 2-3.5 (7) | 0.2-0.7 | 1-1.4 | ..... | 37, 5, 28, 13, 6 |
| Asphalt manufacture | 3.0 | ..... | ..... | 1.0 | 38 |
| Carbon dioxide removal | 2-3 | ..... | 0.5-0.8 | ..... | 43a |
| Clay burning | 1.0 | ..... | ..... | ..... | 44 |
| Clay treating (continuous) | 1.5 | ..... | 1.3 | ..... | 25 |
| Coking | 2-6.1 | ..... | 2-3.8 | ..... | 36, 24, 42, 43 |
| Contacting | 1.5-2.0 | ..... | 1.0 | ..... | 25, 7 |
| Cracking, catalytic | 2-5 (9-11) | 0.3 (0.8-1) | 1.4-5.5 (4.6-8) | 1-1.5 | 2, 48, 39, 47a |
| Cracking, thermal | (5.8) | (.45) | (3.8) | ..... | 39 |
| Deoiling | 1.0 | ..... | ..... | ..... | 50 |
| Dewaxing (MEK) | 2.5 | ..... | 0.4 | ..... | 45 |
| Desalting | | (occasional checking) | | | 27 |
| Desulfurization, gas | 0.25-1 (2.5) | ..... | 0.1-0.3 (3.5) | ..... | 26, 21, 23a |
| Desulfurization, catalytic | 1.0-3.0 (8.4) | 0.33 | 0.4-3.5 (4.2) | 1-1.5 (5.4) | 59, 29, 1, 34, 3, 46a, 47a |
| Desulfurization (bauxite) | 1.0 | ..... | ..... | ..... | 13 |
| Distillation (see Topping) | ..... | ..... | ..... | ..... | ..... |
| Drying liquids | 0.17 | ..... | ..... | ..... | 22 |
| Ethylene manufacture | 7-8 | 0.5 | 5-6.5 | ..... | 8 |
| Hypersorption | 3.0 | 0.7 | 1.4 | ..... | 33 |
| Natural-gasoline plants | 2.0 | 0.5 | 0.3 | ..... | 47 |
| Percolation | 2.3 | ..... | 3.4 | ..... | 25 |
| Polymerization | 1-2.5 | ..... | 0.15-0.50 | ..... | 13, 2 |
| Reforming, catalytic | 1.2-4.7 | 0.1-0.25 | 0.5-2.1 | 0.75 | 51, 53, 57, 58, 31, 15, 54, 55, 30, 4 |
| Solvent treating (and extraction) | 2-3.3 | 0.3 | 0.1-2.0 | ..... | 17, 19, 41, 56, 14, 47a |
| Sulfur manufacture | 0.7-2.8‡ | 0.5-1.5 | 0.2-0.6 | ..... | 16, 46, 40 |
| Sulfur manufacture (including $H_2S$ recovery) | 1.0 | 0.25 | 0.4 | ..... | 49, 18 |
| Treating (light oils) | 0.4-0.7 | 0.05-0.15 | 1.2 | ..... | 35, 12 |
| Topping or distillation | 1-2.7 (5) | 0.1 (1.1) | 2.6 (3.1) | 0.5 | 32, 20, 12, 23 |
| Wax molding | 1-3 | ..... | 1.0 (labor 3-8) | ..... | 52 |

*In parenthesis are shown needs of major refiners or large units. †Usually computed from daily maintenance cost (or yearly percentage of investment) by using half labor and half material. ‡Varies with size because of labor to store sulfur.


**References**

1. Abbott et al., The Oil and Gas Journal, July 18, 1955, p. 92.
2. Anderson and Sterba, The Oil and Gas Journal, Dec. 22, 1945, p. 77.
3. Anon., The Oil and Gas Journal, May 21, 1956, p. 133.
4. Anon., The Oil and Gas Journal, Mar. 19, 1956, p. 159.
5. Anon., Pet. Refiner, Sept. 1948, p. 146.
6. Anon., The Oil and Gas Journal, Mar. 21, 1955, p. 166.
7. Anon., Pet. Refiner, Sept. 1948, p. 234.
8. Anon, The Oil and Gas Journal, Jan. 2, 1956, p. 113.
9. Anon., The Oil and Gas Journal, April 1, 1948, p. 128.
10. Anon., The Oil and Gas Journal, April 1, 1948, p. 161.
11. Anon., Kelloggram No. 1, 1945.
12. Anon., Gray Vapor Phase Bulletin, 1929, p. 13C.
13. Author's files.
14. Baumann and Smith, The Oil and Gas Journal, Sept. 27, 1954, p. 71.
15. Berg, C., The Oil and Gas Journal, Aug. 2, 1954, p. 91.
16. Blohm, C. L., Pet. Engineer, April 1952, p. C-68.
17. Bryant et al., Ref. Nat. Gaso. Mfr., June 1935, p. 299.
18. Carvlin, G. M., The Oil and Gas Journal, May 26, 1938, p. 56.
19. Cottrell, O. P., The Oil and Gas Journal, Dec. 1, 1932, p. 10.
20. Cross, K. C. Testing Lab., p. 346, 1928.
21. Culbertson and Connors, The Oil and Gas Journal, Aug. 11, 1952, p. 114.
22. Dougherty, R. P., Pet. Engineer, June 1952, p. D-10.
23. Dunstan et al., pp. 1580-1618, Oxford Univ. Press, N.Y., 1938.
23a. Dunstan et al., pp. 1806-1809, Oxford Univ. Press, N.Y., 1938.
24. Eppard et al., Pet. Refiner, July 1953, p. 98 (also Anon. article., p. 102).
25. Evans et al., The Oil and Gas Journal, June 8, 1953, p. 116.
26. Feagan, Lawler and Rahmes, The Oil and Gas Journal, April 26, 1954, p. 280.
27. Foster, A. L., Pet. Engineer, Aug. 1951.
28. Foster, A. L., The Oil and Gas Journal, Oct. 27, 1945, p. 96.
29. Grote et al., The Oil and Gas Journal, April 19, 1954, p. 211.
30. Grote et al., Pet. Refiner, 34, No. 4, p. 166 (April 1955).
31. Haensel, V., Pet. Engineer, April 1950, p. C-9.
32. Hamilton, J. P., Pet. Refiner, Oct. 1953, p. 102.
33. Holt, Ben M., Pet. Processing, June 1949, p. 681.
34. Hoog et al., The Oil and Gas Journal, June 8, 1953, p. 92.
35. Hoover, C. O., Pet. Refiner, July 1948, p. 99.
36. Jewell and Conner, The Oil and Gas Journal, Nov. 23, 1950, p. 64.
37. Jewell and King, The Oil and Gas Journal, Aug. 16, 1951, p. 120.
38. Kaskens et al., Ind. Eng. Chem., 40, 548 (April 1948).
39. Kimball and Scott, Pet. Refiner, June 1948, p. 116.
40. Kohl & Fox, The Oil and Gas Journal, Feb. 25, 1952, p. 154.
41. Manley et al., The Oil and Gas Journal, Oct. 26, 1933, p. 78.
42. Martin et al., The Oil and Gas Journal, May 10, 1954, p. 166.
43. Mekler et al., The Oil and Gas Journal, Nov. 16, 1953, p. 203.
43a. Mullowney, J. F., The Oil and Gas Journal, Feb. 10, 1958, p. 93.
44. Myers and Owen, The Oil and Gas Journal, Aug. 4, 1945, p. 93.
45. Parker, F. D., Nat. Pet. News, Jan. 2, 1946, p. R-27.
46. Parker, J. L., The Oil and Gas Journal, Mar. 31, 1952, p. 84.
46a. Parker and Jones, Pet. Refiner, Dec. 1956, p. 189.
47. Prengle et al., Pet. Refiner, April 1956, p. 141.
47a. Refining Engineers Process Notebook, various issues of Pet. Refiner, 1958.
48. Read, D., The Oil and Gas Journal, April 20, 1946, p. 144.
49. Sands and Schmidt, Ind. Eng. Chem., 42, 2277 (Nov. 1950).
50. Schutte, A. H., The Oil and Gas Journal, Nov. 14, 1940, p. 113.
51. Seebold et al., Pet. Refiner, No. 5, 114 (1952).
52. Shannon, R., Pet. Engineer, June 1954, p. C-64.
53. Sittig and Warren, Pet. Refiner, Sept. 1955, pp. 230-280.
54. Teter et al., Pet. Processing, 8, No. 10, p. 1519 (Oct. 1953).
55. Weinert et al., Proc. API 32 (III) (1952).
56. Wilkinson et al., Pet. Eng. Ref. Annual, 1953, p. C-3.
57. Williams, R., Chem. Eng., May 1952, p. 157.
58. Williams and Southerland, The Oil and Gas Journal, Aug. 9, 1951, p. 84.
59. Zahnstecher and Petrarca, The Oil and Gas Journal, Dec. 20, 1954, p. 78.

*Let your plans include the specialized knowledge and resources of the nation's Pioneer Oil Bank.*

**83rd Year of Dependable Service**

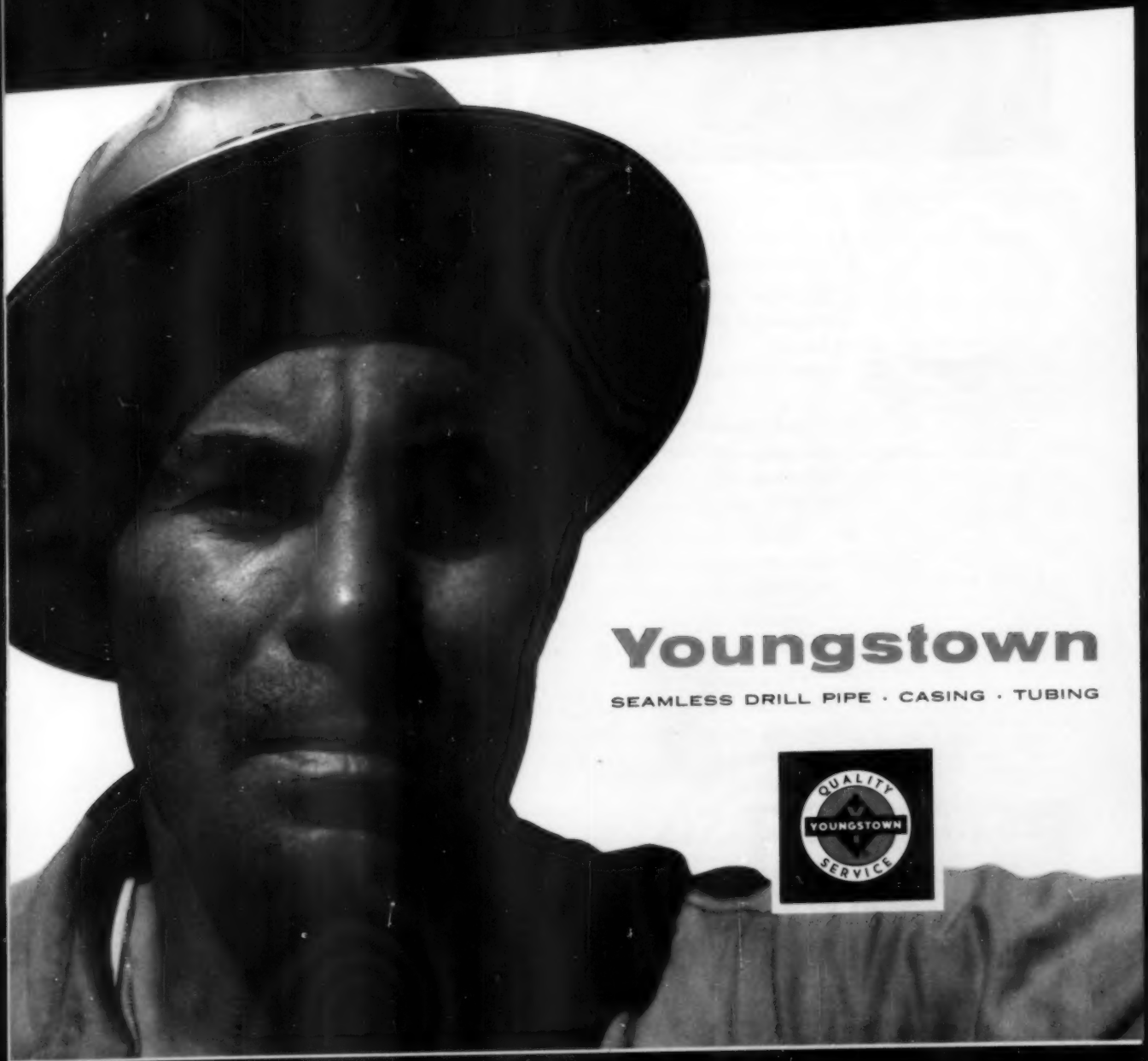
# FIRST NATIONAL BANK IN DALLAS

*Member Federal Deposit Insurance Corporation*

# WHEREVER YOU FIND PIPE WITH ORANGE BANDS YOU'LL FIND A SMART PIPE BUYER

Youngstown's Oil Field Service Corps—nine qualified engineers—stand ready around-the-clock to consult on all your drilling problems. These professional men have offices in the oil fields and will gladly lend you their knowledge and long experience—either prior to drilling or during actual operations. They can tell you, too, about the pipe with the orange bands, the finest seamless pipe made anywhere. Call your nearest Youngstown District Office, today.

**THE YOUNGSTOWN SHEET AND TUBE COMPANY**
*Youngstown 1, Ohio*


Youngstown
SEAMLESS DRILL PIPE · CASING · TUBING
QUALITY
YOUNGSTOWN
SERVICE

with

# HALLIBURTON WATERFRAC

Effective, safe and economical, Halliburton WATERFRAC has compiled a convincing record of fracturing success in wells with formations insensitive to water. *In many cases, sustained production after WATERFRAC treatment has been reported to be at least four times initial flow.*

WATERFRAC uses gelled fresh water, salt water or oil field brines as the fracturing fluid. Its internal breaker permits operation of the treated well with a minimum of delay.

AND THERE ARE OTHER ADVANTAGES TOO:

★ WATERFRAC is suitable for oil and gas well with formations compatible with water. Special additives incorporated in the gel may make it adaptable for fracturing some formations normally adversely affected by water.

★ WATERFRAC is versatile. In formations containing limestones and dolomites, acid added to the fluid may increase the effectiveness of the treatment.

★ WATERFRAC's viscosity allows high sand concentrations with low fluid loss, yet friction resistance is relatively low.

For economy . . . safety . . . production stimulation effectiveness . . . use Halliburton WATERFRAC. Discuss the fracturing requirements of your well with your local Halliburton Representative.

*FOR RESEARCH AND RESULTS IN FORMATION FRACTURING*

## HALLIBURTON FRACTURING SERVICES

HALLIBURTON OIL WELL CEMENTING COMPANY • DUNCAN, OKLAHOMA

## Canadians set nine-well program

INCLUDED in the new work scheduled by Canamerican Drilling, Ltd., Calgary, Alta., is the drilling of nine exploratory wells in southeastern Saskatchewan Province for a group of three companies, consisting of Devon-Palmer Oils, Ltd., Canadian Bishop Oil, Ltd., and Francana Enterprises, Ltd.

The wells will be on a 5,600-acre lease-block recently farmed out to the three companies by Imperial Oil, Ltd. They will be drilled consecutively over a period of 4 months. Drilling depths will range from 3,650 to 4,500 ft., which, in most cases, will permit testing every potential productive horizon through the Mission Canyon formation.

Canamerican Drilling, Ltd., the contractor, is a wholly owned subsidiary of the Devon-Palmer Oils., Ltd., first-named of the three operating companies.

## Who's getting the drilling contracts

**Marine Drilling Co.,** New Orleans, has taken a 12,800-ft. drilling job at a wildcat location in western Lafourche Parish, southeastern Louisiana. Operators are Frank G. Weiner and John R. Fitzhugh, also of New Orleans, whose location, 1 Waterford, is about 2½ miles northeast of Montegut field, in Terrebonne Parish.

**C. B. Webster Drilling Co.,** Houston, has a rig working for Southern Natural Gas Co. Webster's next well at Montegut will be at an east extension location on the Lafourche Parish side of the line. It will be a 12,500-ft. test at 1 Klingman.

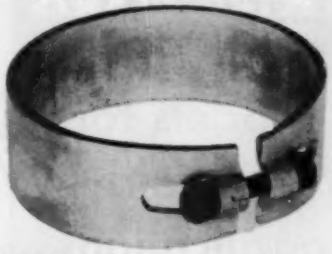
**Owen Drilling Co.,** Lafayette, La., has two new contract operations in southwestern Louisiana. Both are for Petroleum, Inc., one in Calcasieu Parish, and the other in Beauregard Parish. The former is a 11,000-ft. test at 1 Martone, 1½ miles north of Holmwood field, 10 miles southeast of Lake Charles. The other is a 9,000-ft. test in the Fields area. It is a northeast extension.

**Calvert Drilling, Inc.,** working out of Oklahoma City, has the contract on a new wildcat Champlin Oil & Refining Co. is starting a mile north of Ringwood field, in Major County, western Oklahoma. Champlin proposes to take the hole to about 7,000 ft. to test the Cherokee and Manning sands of Ringwood field. Location is at 1 Bymaster, in 33-22n-9w.

**McNabb & Lindsay Drilling Co.,** Winfield, Kans., is drilling for **Big**

**DRILLING** in the Longwood area, west of Waskon, in eastern Harrison County, East Texas, where, in a new active development program, 150 to 250-bbl. oil wells are being completed at depths of 2,400 to 2,500 ft. Shown at the site of one of a series of wells Merco Drilling Corp. is drilling for Arkansas-Louisiana Gas Co. are, left to right: R. O. Shoremire, P. Bufkin, Jr., and L. B. Springer, Jr., crewmen on the rig; J. D. McMillan, Arkansas-Louisiana Gas Co.; Ed Smith, driller; William T. Murphy, owner of the contracting company; and Earl Jones, Wooley Tool Co., Kilgore, Tex. Wells are being completed in the Fredericksburg-Goodland pay in 4 days, rig on and off. The area is near the Louisiana line, just west of Shreveport.

B and W
FRICTION-LOCK CLAMPS
give you these distinct advantages in mounting scratchers and centralizers:



**LOWER COST** . . . Friction-Lock Clamps cost less than welding when ordered with B and W Scratchers and Centralizers.

**WITHSTANDS GREATER THRUST** . . . exhaustive laboratory tests prove Friction-Lock Clamps withstand resistance to vertical movement far in excess of average field welding.

**ELIMINATES WELDING DAMAGE** . . . average field welding may damage casing from undercutting, hard spots and electrolytic corrosion . . . Friction-Lock Clamps cannot damage casing.

**ONLY FULL GRIPPING DEVICE** . . . only the Friction-Lock Clamp grips uniformly around the complete periphery of the casing . . . other holding devices grip over relatively small areas.

**EASIER INSTALLATION** . . . B and W Friction-Lock Clamps may be installed in seconds with a simple hex wrench.

ANOTHER FIRST BY THE FIRST NAME IN PRIMARY CEMENTING TOOLS

*OTHER B and W PRODUCTS:*

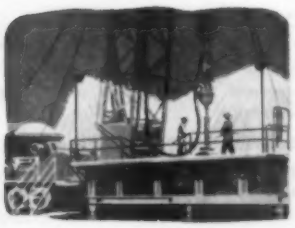
Multi-Flex Scratchers • Nu-Coil Scratchers • Rotating Scratchers, Multi-Flex and Nu-Coil Types • Automatic Stop Collars • Stabilizers • Rotator Collars • Liner Centralizers • Latch-On and Solid Type Centralizers • Thread-Lock Cages • Thread-Lock Cement.

B and W Inc.
Well Completion Specialists
GULF COAST
Box 5266
Houston 12, Texas
PHONE WAlnut 3-6603
WEST COAST
19706 South Normandie Ave.
Torrance, California
PHONE FAculty 1-2463

**Model 5MH22,** *5 KW, 115 volt AC, with housing. Manual starting.*

**KOHLER**
**ELECTRIC PLANTS**

## Models for oil field applications



Sturdy 5 KW model with 4 cylinder engine for rig lights, floodlights, maintenance tools. Also models for offshore exploration, lighting and galley equipment on personnel boats, quarter boats, tugs, barges . . . Automatic stand-by plants for refineries, tank farms. Sizes from 500 watts to 100 KW, gasoline . . . 10 KW to 100 KW, diesel. Write for folder A-47.

KOHLER CO. *Established 1873*
KOHLER, WIS.

**KOHLER OF KOHLER**
Enameled Iron and Vitreous China Plumbing Fixtures • Brass Fittings • Electric Plants • Air-cooled Engines • Precision Controls

**Chief Drilling Co.,** Oklahoma City, at a wildcat location in Finney County, western Kansas. Location is about 11 miles southeast of Garden City at 1 Hines, in 34-26-31. It is a 5,200-ft. test to the Mississippian.

**Woolf & Magee, Inc.,** Tyler, Tex., is getting started on another well for Roger J. Bassett in the Kolin field in eastern Rapides Parish, Central Louisiana. It is a location north of the discovery well which this contractor drilled for the same operator early this year. The discovery well was completed with oil production from a 6,440-ft. sand. It had been drilled to 7,612 ft. The new operation is set up as an 8,000-ft. test.

**Symons Drilling Co.,** Houston, has a rig working on a wildcat location a mile south of Roanoke field, in Jefferson Davis Parish, Louisiana Gulf Coast. It is a contract job for Sam G. Harrison, also of Houston. Location, at 1 Tietje, is in 23-9s-4w. Plans call for a 9,000-ft. test.

**Offshore Co.,** Baton Rouge, La., is getting well down on a newly started deep test it is drilling for Southern Natural Gas Co., of New Orleans, in the West Bay area, Plaquemines Parish, southeastern Louisiana. Location is about 3 miles north of production developed by Gulf Oil Corp. at West Bay and just inshore from the Gulf of Mexico. The test is drilling as 1 Abercrombie, in 9-22s-31e.

**Justiss - Mears Drilling Co.,** Jena, La., has scheduled a 5,500-ft. Wilcox test to be drilled for A. J. Hodges Industries, Inc., in the extreme northeast corner of Rapides Parish, Central Louisiana. Location, at 1 Nesbitt, in 33-6n-3e, is about 4½ miles south of Nebo field, in La Salle Parish.

**Crow Drilling Co.,** Shreveport, is getting under way on a new 10,000-ft. contract in St. Landry Parish, South Louisiana. It is drilling for Siboney Petroleum Co. Location, at 1 Thistlethwaite, in 52-4s-4e, is 15 miles north of Opelousas, and 2½ miles north of the large Washington field.

**Monte Christo Drilling Co.** is to drill a deep exploratory test for Hargrave Oil Corp. and W. E. Colson in the Hargil area of eastern Hidalgo County, in Texas' Rio Grande Valley. Location, on Rio Farms, Inc., land, is about a mile north of Hargil and about ¾ mile from production, a gas well. Location is near the Willacy County line. Permit calls for a 11,500-ft. test.

**THREADS LAST LONGER**
*with*

**IMPROVED**
**to meet the demands of faster, deeper, drilling**

**MONEY BACK GUARANTEE!**

**Sold through your favorite supply store**

**USE JIMMY GRAY DOPE BRUSHES**

**PETROLEUM DISTRIBUTING COMPANY**
BOX 203 - HOUSTON, TEXAS - CApitol 4-9648

# . . . BECAUSE your well deserves the best

When you make your next well in an area of medium depths and pressures, top it with the best casing and tubing heads in the field.

Larkin Casing and Tubing Heads provide simplicity and compactness (for ease of installation and neatness of hookup), safety and economy.

Talk to your Larkin representative. All Larkin Equipment is available through your supply store.

Tubing Head with stripper rubber

Slip Suspension Tubing Head

Tubing Head for shallow, low pressure areas

Casing Head for medium depths and pressures

## LARKIN CASING and TUBING HEADS ARE UNEQUALLED FOR VERSATILITY, DEPENDABILITY and ECONOMY

**LARKIN PACKER COMPANY, INC.**
WAXAHACHIE, TEXAS

LARKIN ...Through Your Supply Store

PESA

LARKIN LEADERSHIP HAS BEEN EARNED BY YEARS OF DEPENDABLE PERFORMANCE

# THE TAPE COATING THAT'S AS MODERN AS YOUR "UNDERGROUND HIGHWAYS"

**Pipeliners discover this time-tested protective coating (polyethylene tape by Polyken) goes on faster... with less labor... and racks up real savings**

***CLOSE-UP OF THE MODERN CORROSION FIGHTER***

Strong, durable Polyken tape *(black spool)* is made of remarkably inert polyethylene . . . resistant to the corrosive effects of moisture, soil chemicals and electrolytic current.

Two examples of modern transportation—superhighway and pipeline—one aboveground, the other below.

But pipe goes places where roads are never seen. Through wooded wilderness . . . across frozen wastes . . . under broiling desert sands.

Polyken adhesive tape coating helps to make the going easier. It requires no primer, no hot dope preparation, no cooling or drying time. Wraps on cleanly, quickly . . . allows pipe to be buried immediately.

Crews are small (about half the size of hot dope crews). Labor costs are low . . . so are handling and equipment costs. And construction efficiency is amazingly high.

Polyken is the tape of experience with a long record of actual use in protective coating. For further information contact the Polyken Sales Division, 309 W. Jackson Blvd., Chicago 6, Illinois. Dept. OG-9.

**Polyken®**

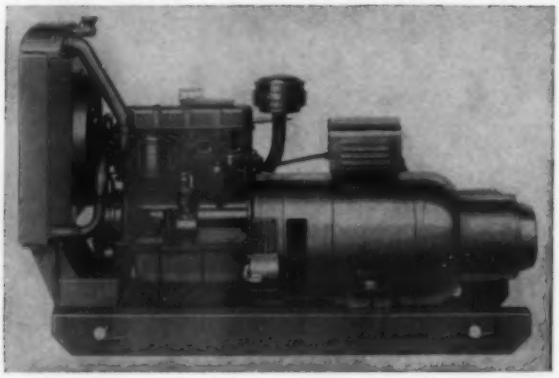
**EXPERIENCED IN MODERN PROTECTIVE COATING**

**The Kendall Company, Polyken Sales Division**

Reprints of Ralph Ballantine's picture, "Underground Highway," without advertising suitable for framing available at $1 from Polyken.

## ▶ ▶ ▶ New Equipment Section

# This week's SHOWCASE features . . .



## Electric plant for standby power

. . . supplies 25 kw. at 120/208 volts and is equipped for remote starting. The generator is a 12-lead, reconnectable, revolving-field type with direct-connected exciter and automatic voltage regulation. Dependable high-torque exciter cranking at high r.p.m. assures quick starting. Voltage regulation is within ±2%; frequency regulation is 3 cycles.

The engine develops 60.7 hp. at 1,800 r.p.m. and is of valve-in-head design. Valve rotators and special alloy-steel exhaust valve-seat inserts insure long valve life. The heat-treated steel crankshaft is dynamically balanced. Special alloys are employed in the connecting rods, main bearings, and cylinder heads.

Standard equipment includes skid base, vibration dampers, low-oil-pressure and high-water-temperature safety devices, lubricating-oil and fuel filter, oil-pressure gage, muffler, and oil-bath air cleaner. **Write or call: Kohler Co., Kohler, Wis., for details on Model 25R81 electric plant.**

●

## Photo-recording paper

. . . picks up faint lines of seismograph equipment used in subsurface geophysical explorations. The new paper—called Peerless Tru-Graf 1—has a high-speed orthochromatic emulsion of medium-contrast which will pick up clearly the fine, faint lines of the timing device without overexposure and blurring of the impulse trace.

Tru-Graf 1 is coated on two different paper stocks—Type 0.005 is a standard-weight alpha sulphite paper. And Type 0.003 is an extrathin, 100% rag-content base with outstanding wet and dry tear strength, good translucency, and excellent folding characteristics. Both papers are matte-finished, to take pencil, ink, and ball-point markings clearly.

They're available in widths from 5 to 12-in. and roll lengths from 100 to 475 ft. **Write or call: Peerless Photo Products, Inc., Shoreham, Long Island, N. Y., for details on Tru-Graf 1 paper.**

●

## Controller mixes gases at preset ratio

. . . despite variations in mixture pressure and total flow. Called the Proportion-Aire, it's available with rated maximum capacities from 500 to 75,000 cu. ft. per hour at pressures up to 100 psi.

It consists of a dual-port mixing valve and either an integral vane type of positive-displacement pump or centrifugal compressor. The total port area varies in response to changes in pressure-drop across the valve, but the ratio of individual port areas, once set, remains constant.

Mixture ratios may be held to within 2% on manual setting and to within 0.2% with appropriate automatic control, at varying demand from 10 to 100% of rated capacity. **Write or call: Selas Corp. of America, Dresher, Pa., for details on Proportion-Aire.**

---

Send this **Showcase Coupon**

to the Manufacturer of the item in which you are interested. See name, address, and equipment name and/or model, in bold-face type at end of description.

NAME AND/OR MODEL NUMBER.....

.....

.....

Described in OIL AND GAS JOURNAL - Issue of September 15, 1958

NAME.....TITLE.....

COMPANY.....

ADDRESS.....

CITY.....STATE.....

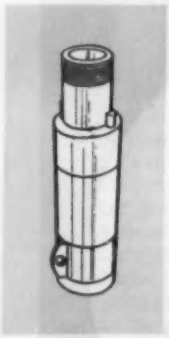
DATE.....

Theo N. Law, Falcon Seaboard's diesel electric, submersible drill barge, equipped with Goodall Rotary Hose.

# Rx Goodall Rotary Hose



## prescribed when only the best is good enough



For example, Falcon Seaboard could not afford less than the best rotary hose for their shallow-water drill barge. Consequently, Goodall Rotary Hose was selected to be used on the barge's 1500 hp mud pump—the largest on the market. The Theo N. Law was still on location and drilling beyond 14,987 feet when last reported. Guaranteed Goodall Rotary Hose continues to give dependable performance.

For a rotary hose that will withstand the highest drilling pressures produced on any rig now in use—specify Goodall. It's good economics, because only Goodall hose has these outstanding features:

The Barney Coupling • The Goodall Safety Clamp • The Goodall Repair Service
The Goodall One-Year Guarantee

# GOODALL RUBBER COMPANY

TRENTON, N. J.

Goodall Rubber Company of Texas: Houston and Odessa

Goodall Rubber Company: New York, Philadelphia, Pittsburgh, Chicago, Denver, St. Paul, Detroit, San Francisco, Los Angeles, Seattle, Salt Lake City, Portland.

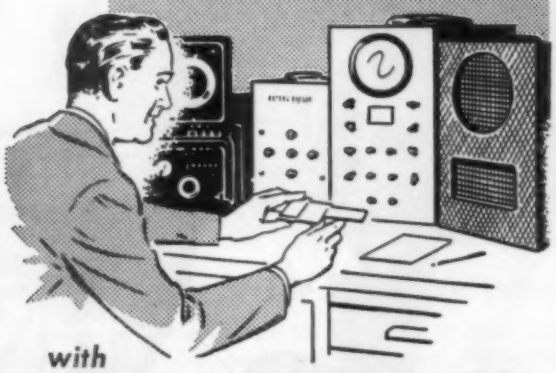
Export: Goodall Rubber Company, Trenton, N. J.

Stocking Distributors: Texas and Louisiana — Houston Oil Field Material Co., Wilson Supply Co., Hunt Tool Co., Heap Equipment Company, Iverson Supply Co.

Available through all qualified supply stores.

# STOP

## EXHAUST NOISE and PIPING VIBRATION



*with*

## BURGESS-MANNING SNUBBERS

Burgess-Manning engineers have spent years of scientific research into the cause and nature of exhaust noise and pipe line vibration. Out of this research came the Burgess-Manning Snubbing Principle.

Throughout the world, Burgess-Manning Snubbers, utilizing this unique principle, are eliminating the deafening, efficiency-reducing roar of engine exhaust and the destructive effects of pipe system vibration and pulsation where compressible gases are pumped.

Engineered by specialists for the specific applications, Burgess-Manning Snubbers pay for themselves in increased efficiency of equipment and personnel, lowered maintenance costs, improved labor and neighborhood relations.

This engineering service, with years of experience in the elimination of noise and vibration, is available for consultation on your problem without obligation.

***Write for copies of case histories of typical installations.***

***Present your problems for Analysis and Recommendations***

BURGESS-MANNING COMPANY

*Sound Engineering* 9217 Sovereign Row, Dallas 35, Texas

Libertyville, Illinois



# IT ROTATES!

- NO STEAM LEAKAGE
- NO WIRE DRAWING

## TRERICE PATENTED STEAM TRAPS HAVE A ROTATING VALVE...ASSURING NO LEAKAGE DUE TO WIRE DRAWING

With every discharge, the valve in a Trerice trap seats in a different position . . . a new seat . . . a steam tight seat every time! Discharging water impinges on the impeller . . . causes rotating action.

**EASIER MAINTENANCE**

A Trerice trap can be inspected and cleaned without removing it from the line, or disturbing the high pressure bolts and gasket. Removable cap permits quick access to valve and seat for inspection and maintenance.

**FREE TRIAL OFFER**

We'll supply one, a dozen, or more Trerice steam traps for your operation on a FREE 60-day trial basis. Act now! Write today for bulletin 1400D containing complete engineering data, valve and orifice charts.

**H. O. TRERICE CO.** 1420-D West Lafayette Blvd., Detroit 16, Mich.

*Sales Offices in Principal Cities of U.S.A. and Canada*

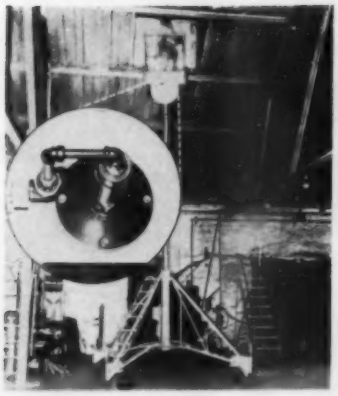


# Oil Loans

THE 1ST NATIONAL BANK OF SHREVEPORT

LOUISIANA'S OLDEST BANK

ROBERT F. CASHEN — Manager Petroleum Department



## Access-lift air motor safe to use

. . . in petroleum and chemical plants where atmosphere, at times, contains explosive mixtures, the maker reports. The lift's air motor drives the hydraulic pump and so eliminates the danger of electric sparks igniting fume-laden air.

Push buttons in the platform guardrail give complete control for raising, stopping, and lowering the lift.

It's designed for a maximum reach of 42 ft. above floor level. It can be transported easily from one location to another. Screw-type levelizing jacks at each corner hold the lift in a steady, level position. Large, swivel-type casters permit ready mobility. **Write or call: Ballymore Co., Lincoln and Garfield Avenues, West Chester, Pa., for details on mobile access lifts.**

•

## Sample cooler comes in stainless steel

. . . for applications in the petroleum process plants. The counterflow heat exchanger employs coil-within-a-shell type of construction. It's suited for cooling extremely high-temperature chemical solutions and process liquids —at line pressures up to 6,000 psig. —prior to testing at atmospheric conditions, the maker says.

It weighs 18 lb. Of a slender cylindrical design, the all-stainless-steel unit can be easily installed at critical check points in overhead piping and relatively inaccessible areas. Available with screwed or ½-in. socket-welding adapter-sample connections, the cooler can be conveniently integrated with any piping system. Tubing extensions on those coolers with weld connections are extensions of the inner coil. **Write or call: Hagan Chemicals & Controls, Inc., Hagan Building, Pittsburgh 30, for details on new sample cooler.**

•

## Oil, vapor adsorber keeps gas clean

. . . for instruments in processing plants. The Vape-Sorber hydrocarbon vapor-adsorption device comes in 14 sizes. Eleven are for normal pressure applications and three are for high-pressure applications.

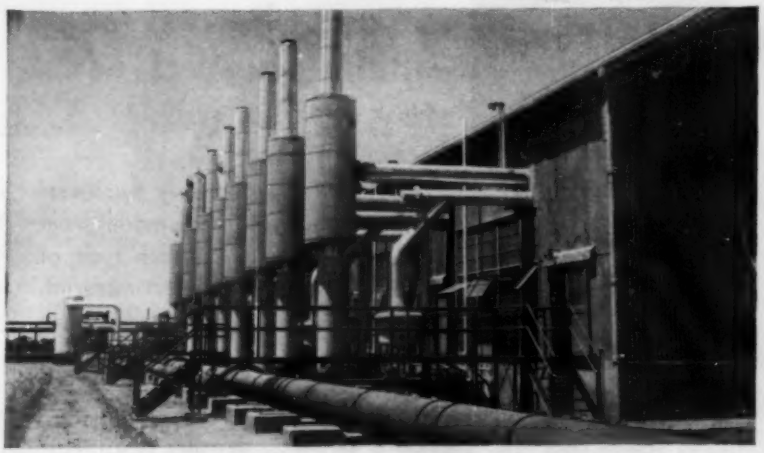
The unit is expected to prove valuable to protect air and other gas systems and pneumatically operated instruments and mechanisms from the effects of oil vapor, free oil, water-oil emulsions, and dirt.

To achieve effective liquid-gas separation, it operates in two stages. The first automatically removes water, water-oil emulsion, free oil in droplet form, and dirt.

The next stage removes oil vapor and free oil in the form of mist by passing the compressed air or gas through an effective adsorbent. Sufficient contact time is allowed to enable the adsorbent to effectively pick up all of the oil vapor and free oil in form of mist and fog. **Write or call: Selas Corp. of America, Dresher, Pa.. for details on Vape-Sorber.**


**SILENCING**

**AT ITS BEST—WITH SOMETHING EXTRA**



Many things affect the design and performance of silencing equipment. It takes experience to discern, classify and screen these influencing factors. The "extra" in every Maxim installation is this: it is based on an evaluation by specialists with unequalled experience in noise suppression.

Add to this basic advantage such other pluses as Maxim's tested and proven principles, the most extensive line of silencers, and consistent research and development — and you can see why Maxim silencers are preferred and more widely used throughout industry than any other make — and why you can specify Maxim with complete confidence.

**new!**

"Guide to Maxim Silencers" Send for your copy now.

**THE MAXIM SILENCER COMPANY**

Subsidiary of Emhart Manufacturing Company

98 HOMESTEAD AVENUE, HARTFORD, CONNECTICUT

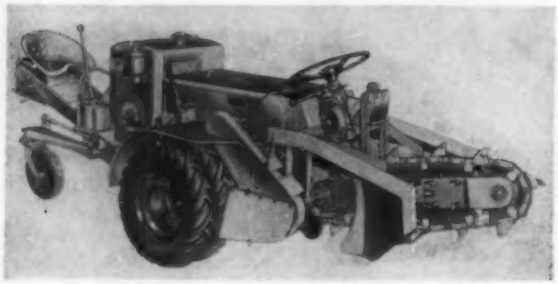
SHOWCASE . . .

# New Equipment

## Ditcher for narrow trenching

. . . of gas lines is rubber-tired and designed to dig 40 in. deep. The Model 702-A machine may be equipped with a chisel-tooth bucket line for digging either 3 or 5 in. wide; or with a hook-tooth line for digging 3½ or 5 in. wide.

A new positive boom-hoist lock gives positive maintenance of grade at any selected digging depth. Also, the boom takeup, for adjusting the slack in the bucket line, has been made more readily accessible. A followup scraper may be obtained as an optional accessory to insure a cleaner trench with minimum handwork. **Write or call: Barber-Greene Co., Aurora, Ill., for details on Model 702-A ditcher.**



●


DESCO LUBRICANTS

STAY

in your plug valves – make plug valves stay on the job!

Plug valve lubrication is our business — *our only business!* DESCO Plug Valve Lubricants are synthetics made from chemical compounds specifically developed for each type of service. They are ALL lubricant and contain no inert material. That's why Desco Lubricants STAY in your valves and do not harden or coke-up.

**HELPFUL COLOR CODE**

The four Standard Lubricants are Color Coded to prevent errors and speed operation. Gun grip, valve tab, carton labels, and the lubricant itself are a matching color to identify the service.

**4 STANDARD AND 3 SPECIAL DESCO LUBRICANTS HANDLE ALL SERVICES**

The DESCO user has the advantage of never having to stock many lubricants — this not only reduces inventory but it also reduces the possibility of using the wrong lubricant. Most plants require only one or two types.

**PACKED IN CONVENIENT STICKS OR BULK**

DESCO Lubricants are available in 6 sizes of sticks, including a gun size stick. For volume users DESCO Lubricants are packed in 5-quart, 40-pound and 100-pound drums.

DELTA-DESCO

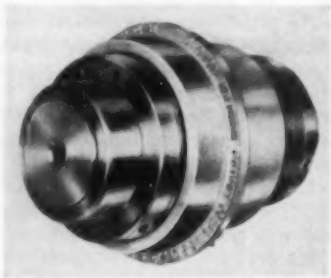
WRITE FOR CATALOG

*The Only Complete Plug Valve Lubrication Company*

PLUG VALVE LUBRICANTS AND EQUIPMENT

Color Coded Lubricants • Hand Guns
Fittings • Air-Motor Volume Guns
Automatic Lubricators • Electronics

DELTA-DESCO COMPANIES
DELTA ENGINEERING SALES CO.
Box 1403 Shreveport, Louisiana
*Branch Offices in All Principal Cities*

## Cutout coupling prevents overload

. . . and allows increased misalignment capacity and ease of maintenance. Its power shutoff action at the instant of dangerous overload is designed for use where power is transmitted through two inline shafts and torque limitation is necessary.

The coupling allows slight parallel misalignment, angular misalignment, or a combination of both. Increased stresses and loads on the connected equipment caused by misalignment can be prevented by careful installation of the coupling. The coupling works regardless of direction of rotation. And it's easy to service. **Write or call: John Waldron Corp., New Brunswick, N. J., for Bulletin 51.**

●

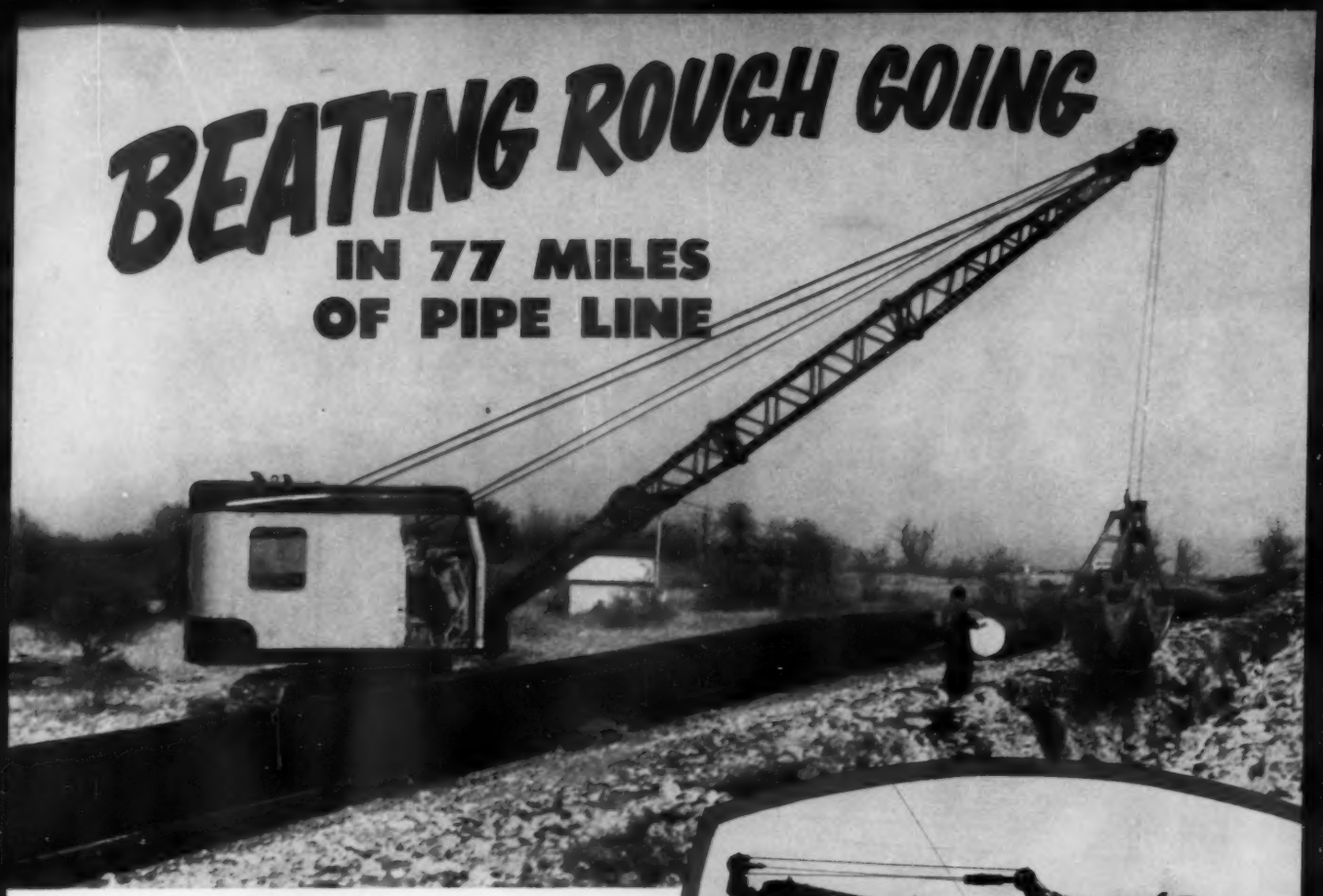
## Joint sealant is resilient

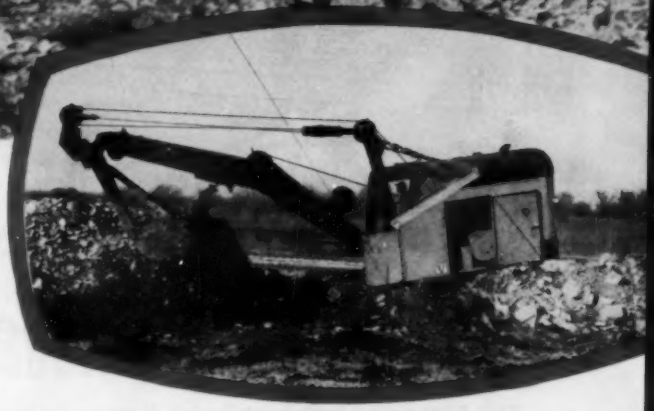
. . . and unaffected by extreme temperatures, expansion, or contraction. Called Stonlast, this material will form permanent, weather-tight seals for cracks and joints in concrete, brick, metal, wood, or virtually any building material. Its foam-rubber-like resiliency enables it to allow expansion and contraction while strongly adhering to the surface to which it is applied. It will not shrink and is unaffected by temperature changes ranging from −50° to +200° F., the maker says.

A synthetic rubber compound, it doesn't contain oils. Thus, it does not

# BEATING ROUGH GOING

## IN 77 MILES OF PIPE LINE





● Perhaps no type of job tests a piece of equipment more than a pipeline. Here are two Northwests that helped put down the 77 mile, 30 in. line for the Cities Service Gas Co. The line ran from Iola to Independence, Kansas and was laid by R. H. Fulton Co. of Lubbock, Tex. There were 12 Northwests on the job. Here was digging of the worst kind. Here was travel over miles of rugged country—and always the unexpected turned up to be met.

These are the things that Northwests are built for! Tough digging! Miles of travel! Meeting the unexpected! That's why pipeline after pipeline has been dug by Northwest Machines. That's why one out of every three Northwests is a repeat order.

Northwest Machinery Bases and Machinery Side Frames are rugged, heat treated, alloy steel castings. Here is strength to withstand the strains of off-balance digging on uneven terrain. It means a lifetime of permanence of shaft alignment. It practically eliminates weaving that causes bearing and shaft wear.

You can go through the whole machine—Booms!—sturdier for workhorse digging and lifting. Uniform Pressure Swing Clutches!—cooler running, trouble-free. The Helical Gear Drive!—running in oil, mounted on anti-friction bearings, free from the adjustments and stretching that come with chain drives. The "Feather-Touch" Clutch Control!—with the true *feel of the load* free from the complications of delicate mechanisms, valves, pumps and tubing. The Cushion Clutch, wide range of Boom Hoist Equipment to choose from, Easy Convertibility—These and many more advantages give you a piece of equipment with ability that you can't find anywhere else for handling the workhorse pipeline jobs.

This is only part of the story. Let us give you complete information on the size machine you need. A Northwest man will be glad to discuss your problem with you.

**NORTHWEST ENGINEERING COMPANY**

1513 Field Building • 135 South LaSalle Street • Chicago 3, Illinois

# NORTHWEST *Always Ready to* GO

NORTHWEST EQUIPMENT IS BUILT IN THE FOLLOWING SIZES

| SHOVELS | CRANES | DRAGLINES | PULLSHOVELS | TRUCK CRANES |
|---|---|---|---|---|
| ⅝ Yd. to 2½ Yd. Capacity | 15-Ton to 50-Ton Capacity | ⅝ Yd. to 3 Yd. Capacity | ⅝ Yd. to 2½ Yd. Capacity | 20-Ton and 25-Ton Capacity |

**Legal payload** of this tank was increased 815 gallons because the weight of the tank was reduced 3470 lbs. through **USS** "T-1" Steel construction.

# USS "T-1" Steel boosts payload 10% saves $90 per week

**This 9,000-gallon tank truck** hauls LP gas on trips averaging 1,000 miles a week. The tank is made from USS "T-1" Steel—44% stronger than the steel formerly used. Because "T-1" Steel is so much stronger, the tank walls were made thinner and the over-all weight of the unit was reduced 3470 lbs. *The weight saved goes into the payload.* The tank carries 815 additional gallons, 10% more payload, and gross weight of the unit stays well under highway limitations.

**Lou Marshall,** President of Petgas Company, says, "This truck's extra payload and lower tolls save us about $90.00 a week—a saving equivalent to one free shipment a week. At this rate, we'll probably write off the additional cost of "T-1" Steel within six months. From then on, the savings will be extra profit."

**Trinity Steel Company** of Dallas built the trailer. Their engineers recommended USS "T-1" Steel construction for two important reasons in addition to weight reduction: "T-1" Steel is weldable and retains its strength and toughness at temperatures down to 50° below zero—a big advantage because the truck operates in northern Michigan.

**In the oil fields,** the high yield strength of USS "T-1" Steel (now available for non-code applications with a minimum yield strength of 100,000 psi) and its exceptional toughness, weldability and resistance to atmospheric corrosion make it ideal for pressure vessels, tanks, derricks and equipment that must have great strength without bulk. Ask your supplier about USS "T-1" Steel the next time you consider new transports. You'll see that it pays for itself in a very short time. If you would like to have more information about USS "T-1" Steel, write United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.

*USS and "T-1" are registered trademarks*

USS

United States Steel Corporation, Pittsburgh
Columbia-Geneva Steel, San Francisco
Tennessee Coal & Iron, Fairfield, Ala.
United States Steel Supply — Steel Service Centers
United States Steel Export Company

**United States Steel**

oxidize and become brittle, nor is it deteriorated by corrosive vapors. It can be applied by trowel, knife, or caulking gun or poured into the opening or joint. It's available in black, gray, aluminum, and tan. **Write or call: Stonhard Co., Inc., 1306 Spring Garden Street, Philadelphia 23, for details on Stonlast.**

●

### Shutoff valve insures closure

. . . despite heavy usage. A neoprene ball, when the stem is retracted, is forced against a beveled seat by fluid inlet pressure to form a positive seal against leakage. When the valve is open, the ball floats free but remains axially aligned with its seat. Reverse stem threads permit conventional operation of the valve.

Rotation of the ball causes a self-cleaning action that minimizes corrosion and collection of sediment within the cage and on the valve seat. Thus it reduces maintenance costs by eliminating seat replacements and/or regrinding. This rotation also limits surface wear on the ball by providing an infinite number of seat surfaces.

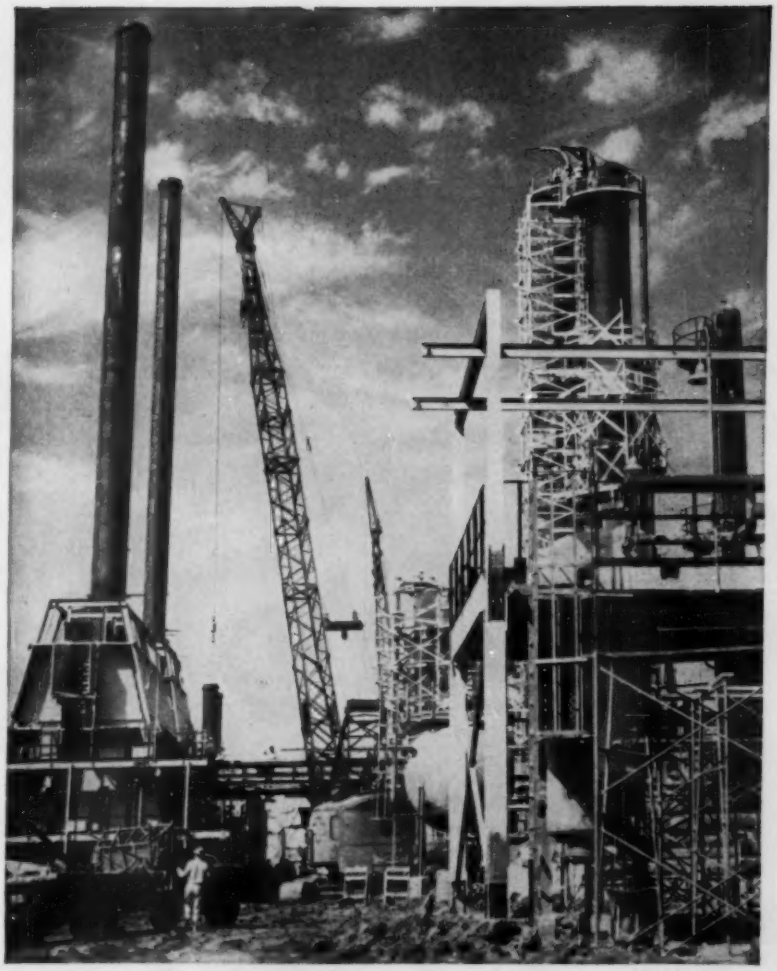
The valve is available in angle or in-line models for most applications involving working pressure up to 150 psi. One valve handles all pressure ranges. Four lead threads permit full open to full close operation with only one-and-a-half turns of the stem. **Write or call: Rene Mfg. Co., 804 Northwestern Bank Building, Minneapolis 2, for details on new shutoff valve.**

●

### 15 kw. diesel power plant

. . . driven by a four-cylinder engine employs a highly efficient fuel-injection system. And the engine is equipped with an instrument panel, air cleaner, oil filter, muffler, and 12-volt starting system.

The generator on the Series ND15 unit is of the revolving-field type with

# CATS MULTIPLY FAST IN CANADA

Nowhere is Canada's swift industrial progress more striking than in the recent development of its oil refining and petrochemical facilities. Canada's daily refining capacity already approaches 700,000 barrels. New petrochemical plants are rising from coast to coast, to meet the demand for paints, alcohol, ammonia, plastics, detergents, synthetic rubber and other products of petroleum or natural gas.

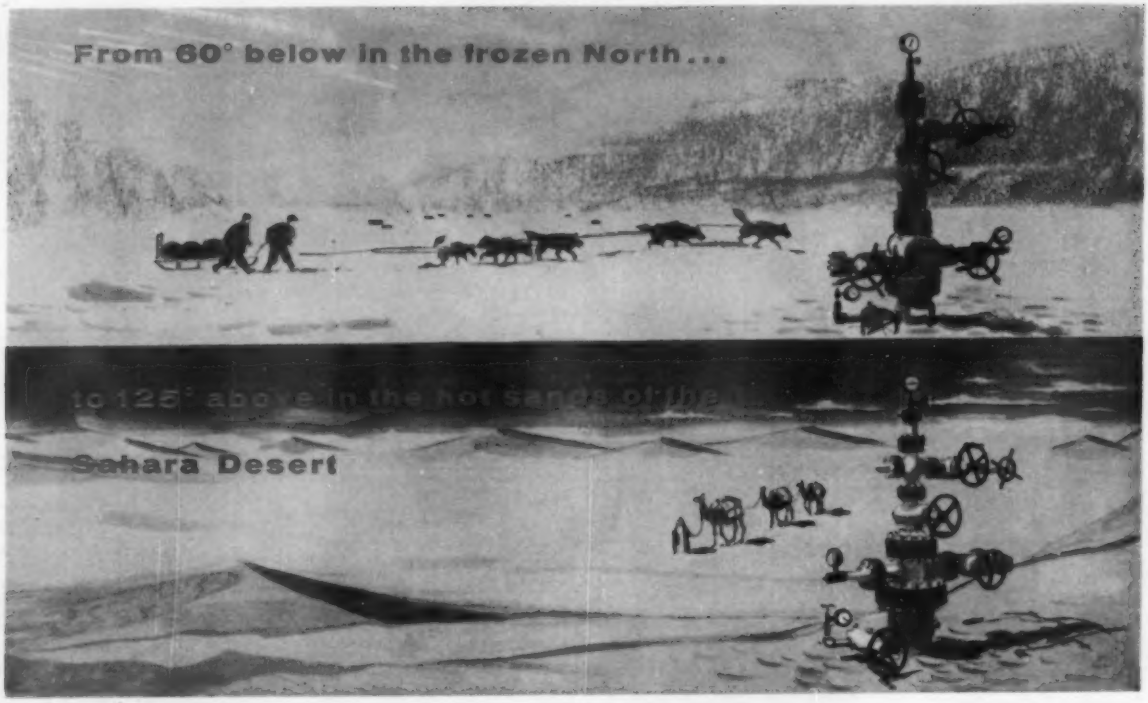
U. S. executives interested in any branch of the oil and natural gas industry in Canada will find a useful ally, and a prompt, dependable source of information in The Canadian Bank of Commerce. Write or telegraph direct to C. H. Munro, Manager, Petroleum and Natural Gas Department, 309 Eighth Avenue, West, Calgary, Alberta, or to our Business Development Division, Head Office, Toronto 1, Canada.

(*We regret that we cannot advise on the merits of oil or mining securities*)

## THE CANADIAN BANK OF COMMERCE

Head Office Toronto 1, Canada

New York • San Francisco • Los Angeles • Seattle • Portland, Ore.
Resident Representatives—Chicago, Dallas, and more than 775 branches across Canada

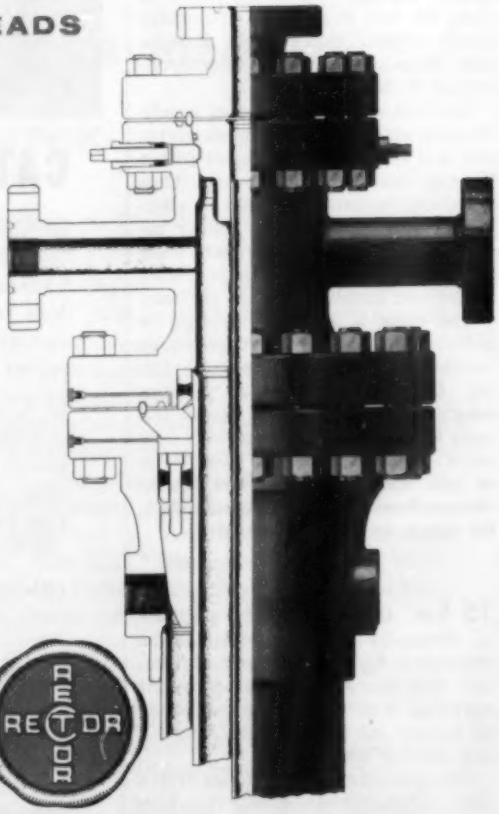



# RECTOR

## Metal-to-Metal Seal CASING HEADS give the best performance.

Neither cold nor heat nor humidity can cause a Rector metal-to-metal seal Rectorhead to fail. In temperature ranges from 60° below zero to 850° Fahrenheit Rectorhead continues to out-perform all others. When you use Rectorheads you "seal-with-steel". The welded seal, plus API ring gasket, does not require replacement or maintenance. It is immune to corrosion inhibitors, will not "flow" under high temperatures nor freeze under low temperatures

Specify a Rectorhead and "seal-with-steel". Available in a complete range of sizes up to 20" through your favorite supply store.



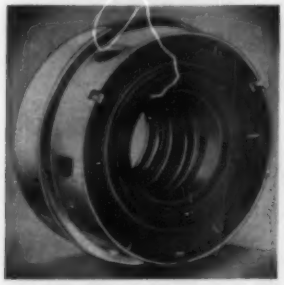
RECTOR WELL EQUIPMENT COMPANY, Inc.
1100 North Commerce St., Fort Worth, Texas
Houston Plant: 2215 Commerce St.
EXPORT REPRESENTATIVES:
Continental Supply Co., Mid-Continent Supply Co., Oil Well Supply Co.

directly connected exciter. It's directly coupled to the engine and aligned on a common, rigid-steel subbase.

Standard voltages are 110, 120/240, 240, and 120/208 at 60-cycle a.c., but other voltages and frequencies are available.

The generator is equipped with an automatic voltage regulator, rheostat, and voltmeter. **Write or call: Norseman Marine, 165 Nevada Street, Oshkosh, Wis., for details on Model ND15 power and light plant.**

●



## Shaft seal for small pumps

. . . is designed to prevent leakage of liquid around a rotating shaft. Known as Type J-2, it is now available in sizes for ⅝ and 1⅛-in. shafts. Maximum design pressure is 60 psi.

A molded-alloy-carbon washer with large driving area provides positive contact and long life. Pressure is equalized over the contact area to reduce wear. The washer will not score, sieze, or warp; is unaffected by changes in temperature, and withstands antifreeze, acids, and other chemical solutions. It's interchangeable with most seals. And it's easy to install quickly without special tools because it automatically positions itself. **Write or call: Schwitzer Corp., 1125 Massachusetts Avenue, Indianapolis 7, for details on Type J-2 shaft seal.**

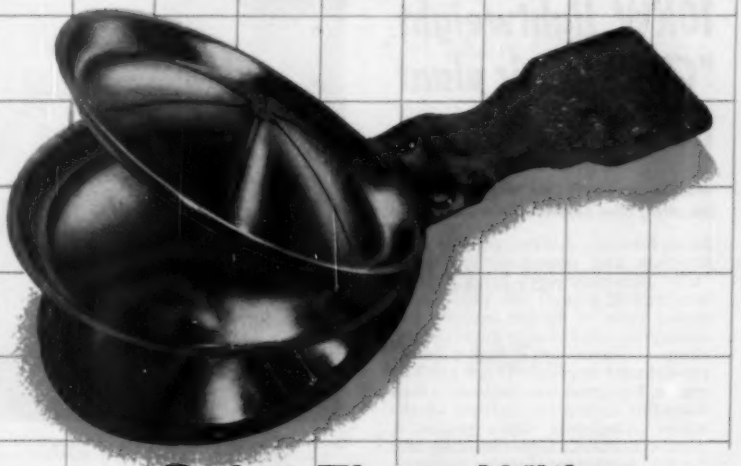
●

## Grout and concrete patching mortar

. . . called Embeco, eases grouting of machinery, equipment, anchor bolts, and around pipes through walls. It is premixed, eliminating the need to select, assemble, proportion, and weigh ingredients. Minimum supervision is needed.

According to the maker, the grout and mortar do not shrink upon hardening and they produce high compressive and impact-resistant strength. Also, they're oil and water resistant and fast hardening. **Write or call: Master Builders Co., 7016 Euclid Avenue, Cleveland 3, for details on Embeco grout and concrete patching mortar.**


"Difficult" Pressure Protection Problems?



Solve Them With...

BS&B *Safety Heads!*

BS&B's D and DV Rupture Discs, which are fully interchangeable in BS&B Safety Head flanges with conventional type pre-bulged discs, are engineered to give highly desirable Safety Head protection to those pressured systems in which one or more of the following "difficult" conditions prevail:

1. When operating pressure must be close to relief pressure.
2. When high operating temperatures are involved.
3. When alternating pressure and vacuum prohibits the use of standard one-layer rupture discs.
4. When pulsating pressure conditions prevail.
5. When a combination of metal and plastic disc construction is needed to obtain lower rupture pressures.

BS&B D and DV Rupture Discs have these advantages:

1. Fast action and unrestricted relief openings.
2. Wider rangeability in selection of metals and plastics for disc components.
3. Longer service life.
4. Rugged construction for added protection against possible damage by rough handling.

BS&B — ANOTHER EXAMPLE OF PRODUCT LEADERSHIP

Let BS&B Safety Heads solve your pressure protection problems. Our engineers will gladly evaluate your pressure system to assist you in proper selection of Safety Heads.

BLACK, SIVALLS & BRYSON, INC.

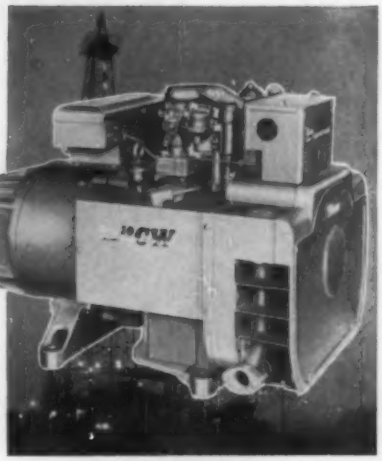
Safety Head Division, Dept. 2-A9
7500 East 12th Street
Kansas City 26, Missouri
Telephone: BEnton 1-7200

ELECTRIC PLANT NEWS

# 10KW lightweight "CW" electric plant has multiple uses

***Mobility makes it jack of all trades on job sites; also dependable standby unit***

In exploration, drilling, pipeline construction and operation, the Onan "CW" does more jobs—better. Weighs hundreds of pounds less than water-cooled units of similar capacity but outlasts so-called "heavy duty" electric plants. Powered by smooth-running, two-cylinder opposed, Onan gasoline engine. Equipped with exclusive Onan Vacu-Flo cooling for enclosed installations. All-climate Onan generator, direct-connected. Skid mounting and 2-wheel weatherproof trailer available.



Onan CW series electric plants are available in 7½ or 10KW. A.C. Choice of all standard voltages. Other Onan Electric Plants from 500 to 200,000 watts.

*See your Onan distributor or write for literature*

**D. W. ONAN & SONS INC.**

3460A University Ave. S. E., Minneapolis 14, Minnesota

ELECTRIC PLANTS • AIR-COOLED ENGINES • GENERATORS • KAB KOOLER



# Hi-eF

**THE SCRUBBERS THAT REQUIRE NO MAINTENANCE**

*for Every Gas Application*

- Compressor Stations
- Processing Plants
- Well Heads

Hailed as the most significant development in scrubbers in the past 20 years, Hi-eF Purifiers have no moving parts that wear out or demand replacement. Scrubbing is accomplished without the use of filters or screens. Nothing to clog up . . . no filters to replace or buy. Occupying a fraction of the space of conventional type gas scrubbers, Hi-eF Purifiers also cost less. Each unit is guaranteed for performance.

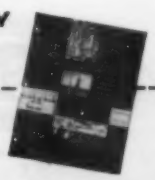
*See the Refinery Catalog*

ANDERSON Hi-eF PURIFIERS

**THE V.D. ANDERSON COMPANY**

*division of International Basic Economy Corporation*

1977 West 96th Street • Cleveland 2, Ohio



**FREE** WRITE FOR BULLETIN NO. 600 with complete information on Scrubbers for the gas industry. Contains convenient Selection Table that saves hours of specification time.

PURIFIERS • SCRUBBERS • SEPARATORS • MIST EXTRACTORS


SHOWCASE . . .

# New Equipment

## Readout device gives accuracy

. . . in the calibration of pressure instruments. Called the Model 850 precision indicator, it can be used with ElectroSyn pressure transmitters to cover any desired set of ranges.

The indicator has two dials. One is a moving dial which travels through 300°. The other is a vernier pointer which travels through 360° for every major division of the moving dial. This provides 1,000 distinct calibration marks which are about 1/10 in. apart.

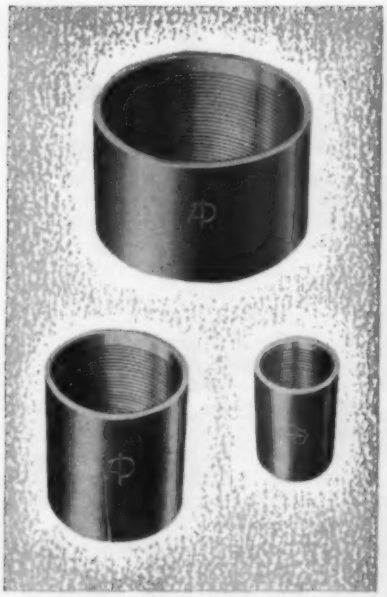
It can be used with pressure transmitters of suitable ranges where precise measurement is necessary. Such a system makes a highly versatile substitute for a time-consuming dead-weight tester in the production calibration of pressure gages, transducers, and other pressure measuring systems. **Write or call: Norwood Controls, Norwood, Mass., for details on ElectroSyn Model 850 precision indicator.**

•

## New reforming catalyst developed

. . . and now available. It fulfills the requirements for a catalyst that will produce very high octane reformates and enables refiners to gain the higher octanes at the same or lower catalyst cost than previously possible, the maker claims. Commercial operation using the new catalyst has been started.

It can be used in existing reformers and is fully regenerable. At very high octane ratings, the rate of catalyst deactivation between regenerations (in situ) is extremely low, even at low recycle gas ratios. **Write or call: Houdry Process Corp., 1528 Walnut Street, Philadelphia 2, Penn., for details on Type 3-G catalyst.**



# HARRISBURG COUPLINGS

Harrisburg Seamless Steel Pipe Couplings are manufactured to A.P.I. and A.I.S.I. specifications for petroleum and other industries. The Harrisburg developed process assures uniformity of threading unsurpassed in accuracy of form, height, angle and lead. Order the best — order Harrisburg couplings.

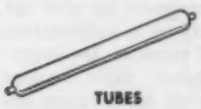
More than a Century (H) in Harrisburg 6, Pa.

**HARRISBURG STEEL CO.**

Division of HARSCO CORPORATION

CYLINDERS

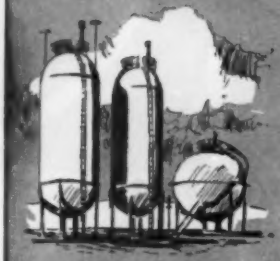
FLANGES

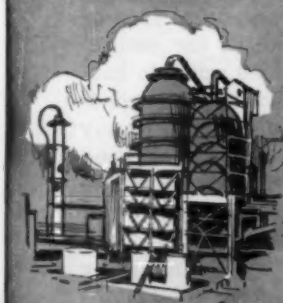

TUBES

TRANSPORTS

INDUSTRY LOANS

PRODUCTION LOANS


DEVELOPMENT LOANS


EXPANSION LOANS

Oil Men Call Us "Bankers".....but

***BANKERS CALL US "OIL MEN"!!!***

One of the largest Oil Credit files in the U. S. Let us prove that "in oil matters it pays to Think . . . FIRST"

**COMPLETE ENGINEERING AND OIL DEPARTMENT**

W. L. KENDALL—Senior Vice Pres.
M. R. BILLINGTON—Asst. Vice Pres.
W. L. MORRIS—Engineer
A. D. McCALL—Engineer

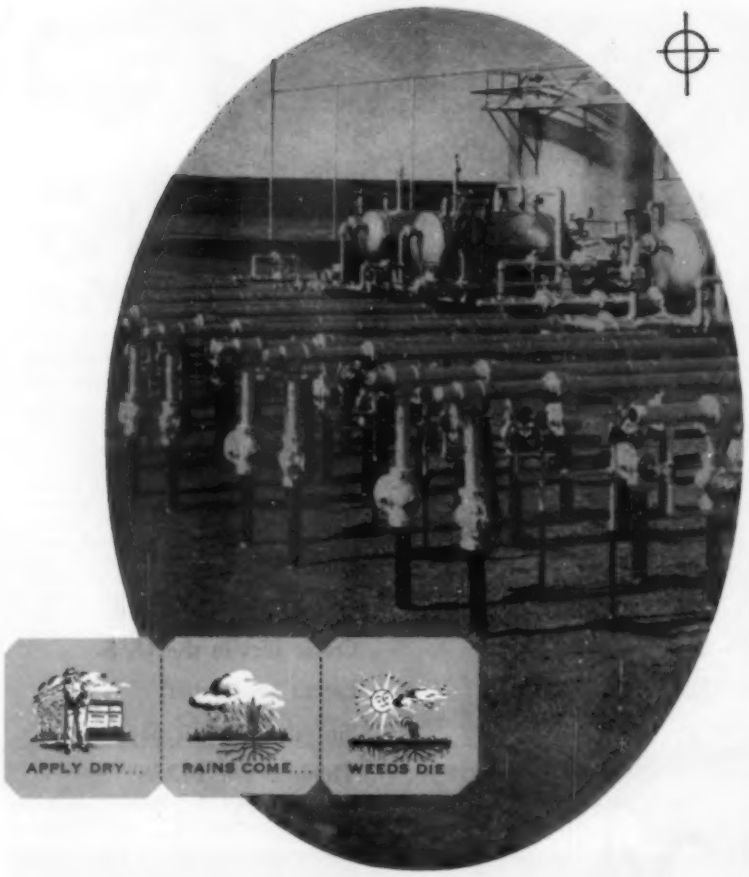
IN OIL MATTERS — *IT PAYS TO* . . .

*Think* 1st *of Tulsa*

FIRST NATIONAL BANK & TRUST CO.

SINCE 1895

Member Federal Deposit Ins. Corp.




*Here's how you can solve your toughest weed problems...*

Get acquainted with new Concentrated BORASCU weed killer! This effective and economical way to keep ground free of weeds and grasses is one of the easiest. There's nothing to mix...no water to haul ...just clean dry borate granules for broadcasting by hand or for application from any mechanical spreader. Concentrated BORASCU is lastingly effective...for as long as 24 months in many cases! So, to lower your costs for "grassing" and, at the same time, to achieve a superior job, start using Concentrated BORASCU weed killer...the kind that's NONPOISONOUS, NONFLAMMABLE, and NONCORROSIVE to ferrous metals.

*Send for new Service Bulletin 10W*

**UNITED STATES BORAX & CHEMICAL CORPORATION**

*Pacific Coast Borax Company Division*

630 SHATTO PLACE • LOS ANGELES 5, CALIFORNIA

**SHOWCASE . . .**

# New Literature

## Four-cycle V-type engines

. . . are described in new 2-color, 18-page Bulletin 262. Examples show significant advances in diesel-engine performance for V-type engines. They operate on diesel, dual fuel, or gas. The engines come with 12 or 16 cylinders. Bore is either 13 or 13½ in. Stroke is 16½ in. Photographs illustrate several V-type engine applications throughout the world for power generation, pipelines, pumping, and chemical processing. Several cross-section drawings help explain engine operation. Included with the new bulletin as supplements are specification sheets covering V-type engines for generator sets and pipeline applications. **Write or call: Nordberg Mfg. Co., Milwaukee 1, for Bulletin 262.**

## Cabled tubes

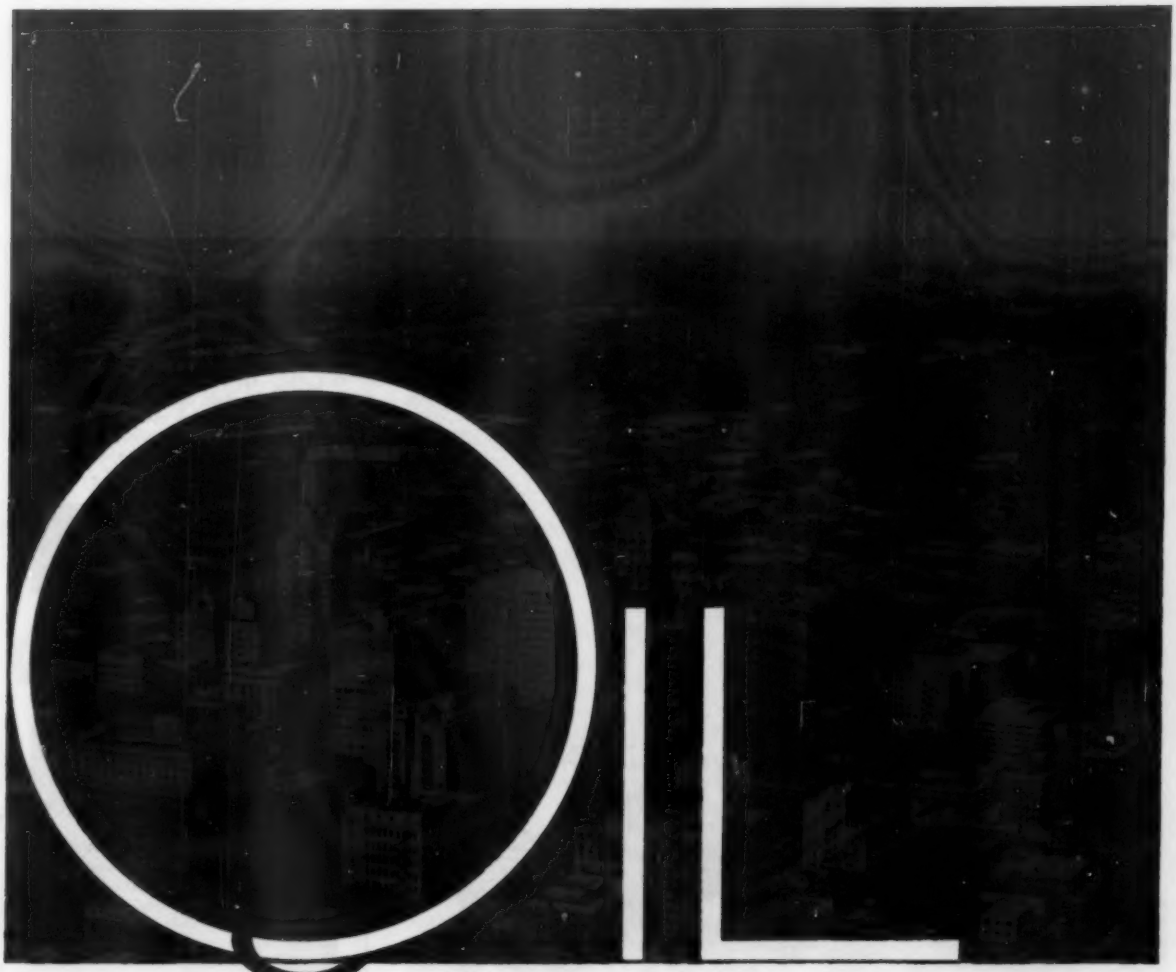
. . . for instruments and controls in refineries and petrochemical plants are detailed in new 12-page bulletin titled "Crescent Armored Multitube." It gives complete details on the various types of tubing, protective armor, and types of corrosion-resistant sheaths, plus installation instructions. Illustrations show general purpose multitubes for indoor use; outdoor and corrosion-resistant types, specials for underground use, and accessories. Much information is devoted to Polyethylene multitube, both standard and special-service types. **Write or call: Crescent Insulated Wire & Cable Co., Trenton 5, N. J., for Bulletin 458.**

## Colored flow diagram

. . . shows the National Tank Co. Frigi-Gas unit for handling high to moderate-pressure distillate wells. The unit is suited for flow-rate requirements from one-tenth million per day up to rated recommended capacities. It can handle a wide range of throughput during a 24-hour period. **Write or call: National Tank Co., Box 1710, Tulsa, for colored flow diagram.**

## Protective assemblies

. . . for multiple protection against stationary-engine damage are described in a new four-page bulletin. Accurately sensitive to temperature and pressure, they will sound an alarm, disengage a clutch, dethrottle an engine, ground a magneto or shut off fuel—all separately or in combination when low lube-oil pressure, low supercharger-line pressure, high coolant and/or converter oil temperature oc-




# NBT key location in the oil industry

Oil men everywhere look to National Bank of Tulsa for valuable assistance. Financing is the key to the oil industry's growth, and NBT has grown with the industry by continually expanding its services to finance successful operations for oil men across the nation and overseas. When you deal with NBT, you deal with oil men like yourself — at the Oil Bank of America.

NATIONAL BANK OF TULSA

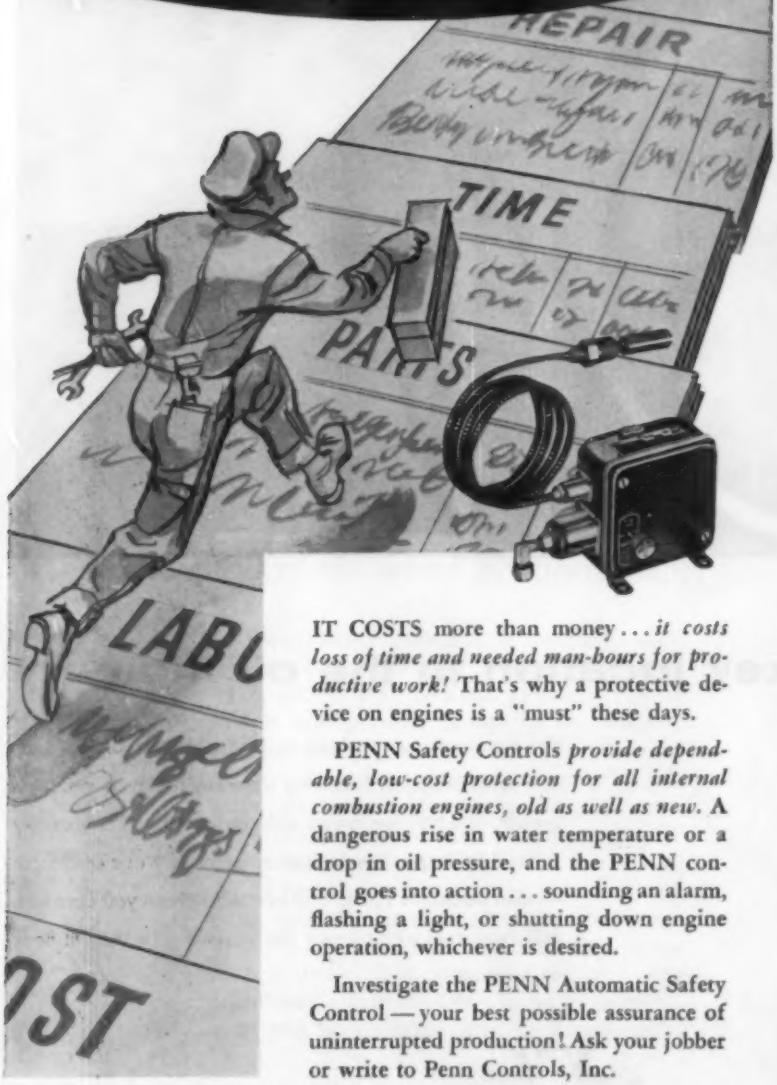
NBT

**NATIONAL BANK OF TULSA**

TULSA, OKLAHOMA

*Member Federal Deposit Insurance Corporation*

# How much does an engine breakdown cost you?




IT COSTS more than money . . . *it costs loss of time and needed man-hours for productive work!* That's why a protective device on engines is a "must" these days.

PENN Safety Controls *provide dependable, low-cost protection for all internal combustion engines, old as well as new.* A dangerous rise in water temperature or a drop in oil pressure, and the PENN control goes into action . . . sounding an alarm, flashing a light, or shutting down engine operation, whichever is desired.

Investigate the PENN Automatic Safety Control — your best possible assurance of uninterrupted production! Ask your jobber or write to Penn Controls, Inc.

**PENN CONTROLS, INC.** Goshen, Indiana

EXPORT DIVISION: 27 E. 38th ST., NEW YORK, N.Y.

AUTOMATIC CONTROLS FOR HEATING, REFRIGERATION, AIR CONDITIONING, APPLIANCES, PUMPS, AIR COMPRESSORS, ENGINES

# new paraffin scraper 4 ways better

***Sunshine's new full length continuous spiral scraper***

It's all new! Longer spiral (circles rod only once each 15") runs full length of sucker rod, with 8" clearance at each end for elevators. Clip-on wing reverses direction at center of rod. Read how you benefit:

**1 saves time**

Run it as fast as you like! Both ends are protected by rod shoulders to prevent hanging.

**2 protects rods**

Reversed spiral eliminates torque — prevents rods from unscrewing. Full-length design eliminates vibration, a major cause of rod breakage. Wing clips on securely—no welding on rods.

**3 moves more paraffin**

Longer spiral offers less foothold for clinging paraffin. Stronger flow carries cuttings away.

**4 easier to install**

Simple to install on location anywhere.

*Write or call today for free literature and prices from one of oildom's oldest established manufacturers of paraffin-control equipment.*

EXPORT DISTRIBUTOR: Lucey Export Corp.

**SUNSHINE IRON WORKS**

601 W. Murphy Odessa, Texas

Phone FEderal 7-6651

DESIGNED FOR
• • • TESTED
AND PROVEN
IN THE OIL FIELDS

FIELDMASTER
BALL BEARING MOTORS



• VERMIN PROOF
• DRIP PROOF
• CORROSION RESISTANT
• MOISTURE PROOF
• FORCED AIR COOLED

Yes . . . all these features are combined in Fieldmaster Ball Bearing Motors to make them the leading power units in the oil country. Naturally there's a type and H.P. especially suited to fit your specific requirements.

Contact us for complete information on any motor requirement.

BETHLEHEM
SUPPLY COMPANY
TULSA, OKLAHOMA
Manufactured by
VALLEY ELECTRIC CORP.
ST. LOUIS 8, MISSOURI


curs. The assemblies are air-activated. One assembly will police a combination of possible trouble spots and will alarm and protect in a combination that best suits the operation, the maker says. **Write or call: Kysor Heater Co., Cadillac, Mich., for Protectorstat Assemblies bulletin.**

## Custody transfer systems

. . . are detailed in a new eight-page brochure. The two systems—positive meter tank and positive displacement meter—are diagramed in minute detail. System operations are outlined, and additional general information is provided. The booklet also presents component equipment including b.s. and w. monitors, automatic samplers, control panels, prover tanks, and an emulsion treater. **Write or call: Murdock Tank & Mfg. Co., 3418 South Santa Fe, Tulsa, for Custody Transfer Systems brochure.**

## Oil-field water consulting service

. . . is described in a new four-page bulletin. The bulletin points out how the service can maintain oil-field water conditions that assure maximum oil removal, and prevent or minimize gyp deposits, corrosion, and organic growths in both input and production wells. Six case histories of waterflood problems ranging from severe leakage in water lines to plugged, corroded water systems are detailed. **Write or call: Bradford Laboratories, Hagan Building, P. O. Box 1346, Pittsburgh 30, for Oil Field Water Consulting Service bulletin.**

## Boilers for burning

. . . carbon monoxide gas in refineries are described in a new 20-page catalog. Titled "C-E Boilers for Catalytic Regenerator Waste Gas," the catalog explains design features of the boilers. They are intended to recover both chemical and sensible heat from refinery waste gas. Cutaway views show construction features and tangential burners. Four pages give engineering data on waste fuel products. **Write or call: Combustion Engineering, Inc., 200 Madison Avenue, New York 16, for C-E boilers bulletin.**

## Full-encirclement saddle

. . . dimensional data, cyclic life, and correct welding procedures are detailed in Bulletin TT 866. The saddle provides 360° reinforcement of pipe and is split longitudinally. The new bulletin includes a chart of relative life of branch connections, showing cyclic life of the full-encirclement saddle is 11 times greater than that of


Up to Your Neck in Salt Water?

Make your *next* pipe replacement your *last*
with
Southwestern
*PVC and KRALASTIC*
*Plastic Pipe*

SALT WATER DISPOSAL becomes the *least* of your production problems, because SOUTHWESTERN Plastic Pipe:

Does not react to electrolysis, corrosion or salt water or sour crude;

Is installed quickly and simply, at very low cost;

Requires absolutely no maintenance cost for years.

ENGINEERS ON CALL: a trained staff of APPLICATION ENGINEERS is on call to consult with you in your pipe needs.

Mail Today!

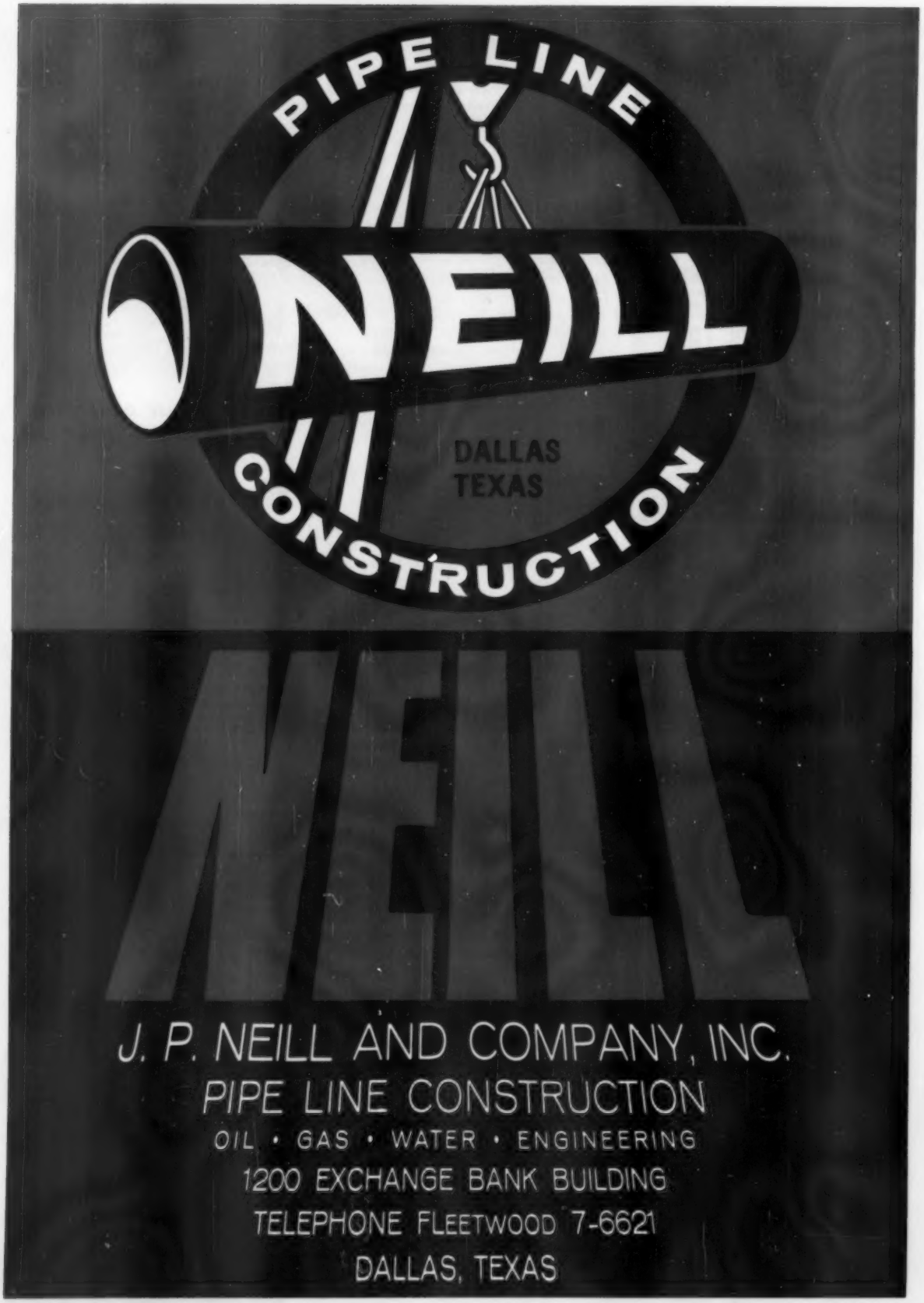
Gentlemen:
☐ Please send me additional information.
☐ Please have APPLICATION ENGINEER call.

NAME _____
POSITION _____
ADDRESS _____
_____
CITY _____ STATE _____

"Use Southwestern . . to be sure"

MANUFACTURED BY
Southwestern
PLASTIC PIPE CO.
Member of the American Petroleum Institute
P. O. Box 117 • Mineral Wells, Texas
Phone FA 5-3344

SWP-3


PIPE LINE
NEILL
DALLAS
TEXAS
CONSTRUCTION
NEILL
J. P. NEILL AND COMPANY, INC.
PIPE LINE CONSTRUCTION
OIL • GAS • WATER • ENGINEERING
1200 EXCHANGE BANK BUILDING
TELEPHONE FLEETWOOD 7-6621
DALLAS, TEXAS

ordinary saddles and over 100 times greater than that of unreinforced branch connections. The bulletin reports two important dimensional changes. They are expansion of size range to include full-size outlets for sizes up to 24 in., and center-to-end dimensions which now equal the outside diameter of the run pipe. **Write or call: Tube Turns, Div. of Chemetron Corp., Louisville 1, Ky., for Bulletin TT 866.**

## Force-balance transmitters

. . . which measure and pneumatically transmit flow, differential pressure, level, and specific gravity over wide ranges are described in two new Specification Sheets P21-7 and P22-2. The transmitters measure over a minimum range span of 0-2 in. Water under service pressures to 50 psig., to a maximum span of 0-2,000 in. Water under service pressures to 5,000 psig. No viscous or other dampening devices are needed. Stability is maintained by a newly developed reset type of booster relay. **Write or call: Baily Meter Co., 1050 Ivanhoe Road, Cleveland 10, for Spec Sheets P21-7 and P22-2.**

## Gas-lift plunger

. . . designed to minimize fluid slippage is discussed in a new four-page booklet. Designated Type A, the plunger is made of corrosion-resistant materials. Included in the booklet is the plunger application, design, construction, and operation. Cutaway views show internal construction. **Write or call: Camco, Inc., 7010 Ardmore Street, Houston, for Type A Plunger bulletin.**

## Sucker-rod comparison chart

. . . that's pocket size is now available. It's a quick field reference guide for grade, yield, and tensile strength of sucker rods. The new four-page brochure quickly and graphically compares the various makes of sucker rods in a condensed version suitable for carrying in a shirt pocket. **Write or call: Axelson Mfg. Co., P. O. Box 58335, Los Angeles 58, for sucker-rod comparison chart.**

## Quick-opening butterfly valves

. . . are detailed in new Bulletin 71-B. The valves have stainless-steel trim and are more resistant to corrosion than standard plug or gate valves, the maker says. They can be used to replace standard plug and gate valves. The bulletin also cites a reduction in price of the valves. **Write or call: Hale Mfg. Co., P. O. Box 1923, Tulsa 1, for Bulletin 71-B.**

CUT COSTS WITH THE NEW

VIC-EASY®

METHOD OF JOINTING LIGHTWEIGHT PIPE

SAVE UP TO 60% IN PIPING COSTS!

Now there's no need to buy overweight pipe. Thanks to Victaulic engineering, you can select lightweight pipe "job-rated" to your conditions and install it the *new VIC-EASY way*. You'll cut costs of pipe, transportation, and handling —you'll save from 30% to 60% in man-hour installation.

1. LIGHTWEIGHT PIPE in thicknesses from .065" handles high pressures. Leading mills make sizes 1¼" to 12", steel or aluminum, with *VIC-EASY roll-grooved ends.*

2. VIC-EASY PORTABLE GROOVER rolls grooves into pipe in seconds. Manually or power-operated, this groover removes no metal . . . retains full wall thickness.

3. VICTAULIC SNAP-JOINT COUPLING assembles and locks by hand—no wrenches or tools required. Other bolted styles of Victaulic Couplings alternately usable.

4. VICTAULIC FULL-FLOW FITTINGS team up with our couplings and lightweight pipe to provide a *complete VIC-EASY system* . . . cuts costs of installation *and* operation.

For complete information write for Bulletin EE-9.

VICTAULIC COMPANY OF AMERICA
P. O. BOX 509 • Elizabeth, N. J.

## Otis Engineering Corp. adds Ferguson, Thrash, Powers

**. . . to the gas lift equipment sales force, according to M. B. Roach, general sales manager. L. T. Ferguson will be assigned to the Longview, Tex., division. P. J. Thrash will assume his duties in the Corpus Christi, Tex., division; and C. E. Powers will locate in Belle Chasse, La., in the Lafayette division. Pictured discussing the latest model of the Otis concentric Type C gas lift valve are: J. R. Russell, assistant manager of field sales; Carlos Canalizo, senior design engineer; Ferguson; Thrash; and Powers.**

## Ben F. Kelley Co., Inc., names

. . . Glenn G. Chance, Chance Sales & Service, to represent Kelley in the East Texas, North Louisiana, Arkansas, and Mississippi area. R. F. Jones, Jr., has also been appointed to represent Kelley in the Oklahoma and Texas Panhandle area. Chance is located in Shreveport, La., and will carry the full line of KelCo products. Jones is located in Pampa, Tex. He was formerly a field representative for General Supply Co. and Rodman Supply Co., both of Pampa.

G. G. Chance

R. F. Jones

## L. C. Taylor transfers

. . . to Henderson, Ky., where he will be sales engineer for Dowell division of The Dow Chemical Co., according to L. J. Kutlich, district manager. Taylor joined Dowell in 1954 as a service engineer at Mt. Carmel, Ill. Prior to this, he was with Atlantic Refining Co. He has served Dowell as a sales engineer, petroleum engineer, and as a development engineer.

L. C. Taylor

## Perry and Tomlin appointed

. . . as sales representatives for BJ Service, Inc., according to John B. Merritt, executive vice president and general manager. Homer S. Perry will fill a sales position in the Hill City, Kans., area. Dave R. Tomlin will be a sales representative for the Four Corners area, working out of the Farmington, N. M., station.

## Enardo Manufacturing names

. . . American Engineering & Equipment Co., Ltd., San Francisco, Calif., as Far East distributor. American Engineering will be the sole distributor for Enardo products in Japan, Korea, Formosa, Guam, Okinawa, Thailand, Viet Nam, and Bangkok, according to Frank P. DeLarzelerc, sales manager.

## Alco Products, Inc., names

. . . John P. Gregor as sales engineer in Houston for its line of diesel-electric drilling rig power packages. He has previously served with Phillips Petroleum Co., Caterpillar Tractor Co., Unit Rig & Equipment Co., and J&L Supply Division.

## Mid-Continent Supply Co. names

. . . J. H. Kenyon as sales manager and L. B. Levell as assistant sales manager at the Fort Worth, Tex., office according to D. H. Thornbury, president. Named vice president of Mid-Continent Supply Co. of Venezuela, C. A., is John Davis, formerly Caracas manager and New York export manager for Mid-Continent Supply. Kenyon, with the company since 1947, was formerly assistant general sales manager. Levell has been in sales and machinery departments in the Denver office, most recently as division machinery manager. Davis will help direct the company's operations in Venezuela.

J. H. Kenyon

L. B. Levell

John Davis

## Explosion and fire destroys manufacturing plant

**. . . and well-logging maintenance shop of Hycalog, Inc., Shreveport, La., according to J. R. Mayeaux, president. The estimated loss is between $250,000 and $300,000 in buildings and inventories of materials, equipment and parts. One of the greatest losses was its research laboratory. Plans have been started for rebuilding the plant and until that time, machine work for the diamond tool manufacturing division will be contracted to other Shreveport machine shops.**

### Dr. J. F. Dunn named

. . . as assistant director of research of Walworth Co., according to Dr. Forest Monkman, director of the research division. Prior to joining Walworth in 1957 as a research engineer, Dunn was a project leader in the dynamic analysis and control laboratory at Massachusetts Institute of Technology.

### The Western Co. appoints

. . . Don Walters to the position of Odessa district manager, according to Walter Beadle, vice president of operations-sales. Walters was formerly assistant Midland division manager. He will be in charge of both sales and operations functions in the Odessa district. Lloyd Helm will remain as Odessa district operations supervisor and A. P. Brown as district sales supervisor.

### Grant Oil Tool Co. opens

. . . a new branch in Liberal, Kans., with a complete line of stabilizing, reaming, and hole enlarging tools. Kenneth Shellman, field engineer with Grant for 17 years, has been appointed branch manager. This branch will service and sell Grant products in the southern Kansas and Texas Panhandle areas.

### Harold T. Holden appointed

. . . manager of export operations, according to Robert M. Greer, president of George E. Failing Co., Enid, Okla. Holden has been with Failing since 1945. The export office is located in New York City. Failing is a subsidiary of Westinghouse Air Brake Co.

H. T. Holden

### Industrial Supply Co. opens

. . . a branch store at Perryton, Tex., Lewis Hearon has been named store manager. He transfers from Industrial's Snyder, Tex., store, where he had been a field salesman. Other appointments for the new Perryton store include Bob Richardson as chief field salesman and Stanley McKee as floorman.

### Electro-Technical Labs obtains

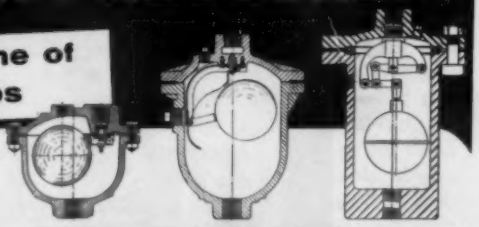
. . . the assets of Electro-Technical Labs, Alberta, Ltd., according to P. C. Sundt, general manager of the Houston firm. The Canadian company operated as a separate entity until the acquisition. The E-T-L Canadian or-

### Genesys Corp. completes new Los Angeles facilities

**The new structure contains 10,000 sq. ft. of floor area. Interior modifications resulted in functional development laboratory and manufacturing space for the Genesys systems engineering and product development staff. A complete micromachine shop is housed in a special dust-free laboratory devoted to the development of precision electromechanical components.**


FOR BETTER VENTING OF GASES FROM LIQUIDS UNDER PRESSURE...

Select from the complete line of Armstrong Ball-float Traps



**Corrosion-Resistant Parts**—stainless steel standard . . . also available in nickel, monel, various grades of stainless, and other weldable materials which can be fabricated, cast or forged.

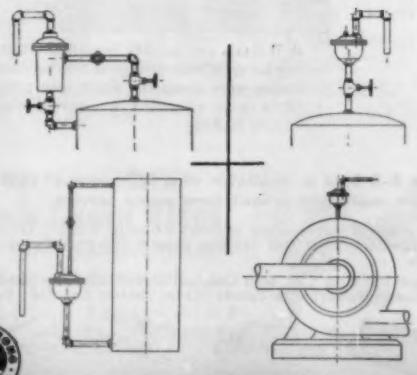
**For Any Pressure**—special designs for particular needs . . . standard to 1000 psi.

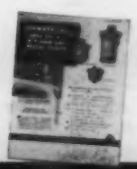
**For Any Capacity**—three types for most economical application to your conditions.

**Moderately Priced**—due to mass-production economies from using many of the same basic parts used in the production of thousands upon thousands of Armstrong steam traps.

**Fast Service**—by qualified Representatives around the world.

**Unconditionally Guaranteed**—to satisfy on a money-back basis.





**Send for Helpful Bulletin**—Bulletin 4501 tells how to select and install gas-relief traps, gives complete physical data and prices of Armstrong vent traps.

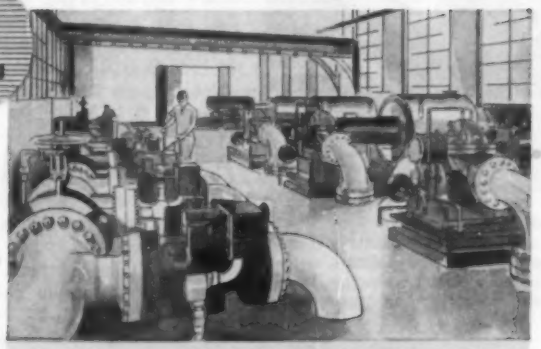
For your copy, call your local Armstrong Representative or write today to:

**ARMSTRONG MACHINE WORKS**
8686 Maple Street • Three Rivers, Michigan

# A Solution to Pipeliner Problems

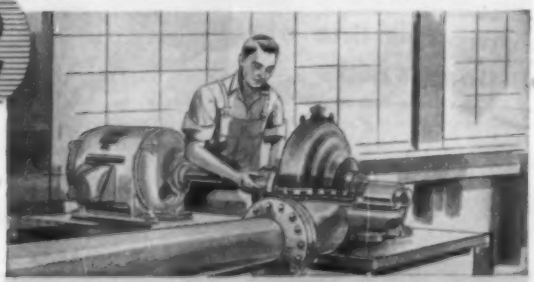
8-B SHAFT SEAL

**1 ON HIGH PRESSURES**



Specially engineered hydraulically balanced construction permits handling of all pressures encountered in modern pipe lines. Pipeliners report that 8-B Seals in continuous main line pump service for more than 44,000 hours are still in perfect working condition.

**2 ON MAINTENANCE MAN-HOURS**



8-B Seals are quickly installed. Removal of the top casing on split case pumps is not necessary. Simply slide the entire unit along the shaft into position. Once installed, little or no attention is required. Service-life is long. No messy leakage.

**The 8-B Seal is available in a full range of shaft sizes for every main line or tank farm pump service.**

For general information request Bulletin S-215-1. Give mechanical specifications and service details for specific recommendations.

Crane Packing Co., 6419 Oakton Street, Morton Grove, Illinois. (Chicago Suburb). *In Canada Crane Packing Co., Ltd., Hamilton, Ont.*

CRANE PACKING COMPANY


ganization is headed by T. G. Gilbert, manager. He formerly was a sales engineer with Electro-Technical Labs in Houston.

## Reed Roller Bit Co. announces

B. A. Wendt

. . . several changes in the sales organization, according to H. B. Book, vice president, sales, at Houston. B. A. Wendt, former assistant sales manager, is named Texas Gulf Coast division manager at Houston, succeeding R. V. Ellis who transfers to the southeastern division, Louisiana, as division manager. A. A. Ezzell, former Corpus Christi, Tex., district manager in the Texas Gulf Coast division, has been promoted to division manager, North Texas division, Wichita Falls, Tex. He assumes the post vacated by the death of J. R. Brandon, Jr.

R. V. Ellis

A. A. Ezzell

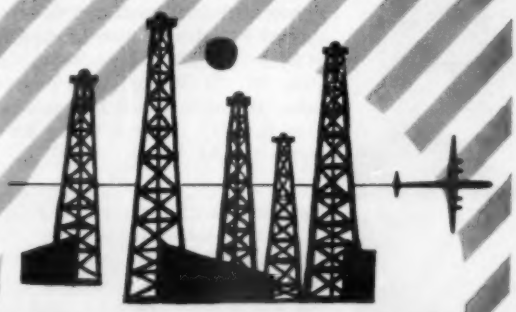
Reed's Kansas and Oklahoma sales divisions, including the Panhandle of Texas, will be combined into one division with headquarters in Oklahoma City. W. H. Armstrong, presently Kansas division manager, moves to Oklahoma City as division manager of the combined division. R. C. Gann, former division manager of the Oklahoma sales division, goes to Casper, Wyo., as division manager of the Rocky Mountain division.

W. H. Armstrong

R. C. Gann

## A. M. Hazell, Jr., assigned

. . . as manager of petroleum equipment sales for Electro-Motive Division of General Motors Corp., according to Paul R. Turner, director of sales. Hazell, who will headquarter in Houston, succeeds H. P. Gustav-



# FLY DIRECT TO THE WORLD'S OIL CENTERS VIA KLM

Only KLM — "The Oilman's Airline" — offers you such complete, one-carrier service, linking all the major oil capitals of the world directly.

**From Houston:** direct to Europe, Africa, the Near, Middle and Far East.

**From Miami:** direct to South America. Daily service.

**From New York:** direct to all Europe and beyond; also to Curacao, Aruba and South America.

**Cargo, too:** moves fastest on KLM. Same direct service; rapid ground handling. Awkward shapes easily accommodated.

**For passenger service:** Call your Travel Agent or KLM office.

**For cargo service:** Contact your Cargo Agent, Forwarder or KLM office.

THE WORLD OVER
KLM
ROYAL DUTCH AIRLINES

KLM
Royal Dutch Airlines
430 Park Avenue
New York 22, N. Y.

# no more knuckle-busting...

# New RIDGID 450 Portable Tristand Chain Vise

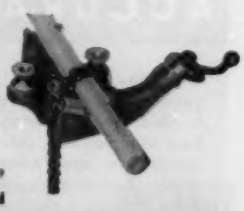
## has Large, Easy-to-Operate Top Screw Handle right up on top!

Here's a real time saver. Not only do you get a complete workbench that's truly portable, but now you get a chain vise that's extra easy and fast to operate. Handle is right up on top where it's always handy. Handle and tightening nut are anchored to vise base . . . can't pull out.

Vise base, that overhangs front legs for clear tool swing, has hanger slots for tools, 3-size pipe bender, rear pipe rest and adjustable ceiling brace screw. Folding legs and integral tray set up easily and lock in position for rigid work base. Snap chain holds folded legs closed for easy carrying . . . no loose parts. Rubber grommets in tristand feet prevent creeping. See and try this more-for-your-money RIDGID Top Screw Chain Vise at your Supply House!

**New RIDGID Bench Chain Vises** have same Extra-Efficient Top-Screw Adjustment.

5 Sizes for ⅛" to 8" Pipe, Conduit or Rod



The Ridge Tool Company, Elyria, Ohio, U. S. A.

son. Hazell will be assisted by two factory service engineers, Thurlow Fernandez at Houston and Ed Chernoff at New Orleans.

### Dr. C. D. Goodman appointed

. . . as Schlumberger Well Surveying Corp., vice president and director of research at the company's research laboratories in Ridgefield, Conn., according to W. J. Gillingham, president. Goodman will serve under A. Blanchard, vice president, technique. Goodman was formerly with the Atomic Energy Commission, Union Oil Co., and Kelco Co. in California.

V. A. Hamilton

O. M. Lorenz

### J&L Supply Division names

. . . V. A. Hamilton, salesman at Pleasanton, Tex., to district sales manager of the Panhandle district at Amarillo, Tex.; and O. M. Lorenz, assistant district sales manager of the Illinois-Kentucky district, to district sales manager of that district with headquarters at Olney, Ill. The announcement came from W. L. Wolfe, vice president, sales. Hamilton joined J&L as a storeman in 1937. Lorenz began his career with J&L Supply in 1939.

### Howard Anderson named

. . . eastern sales engineer for BS&B International, S. A., a subsidiary of Black, Sivalls & Bryson, Inc., according to Carlos F. Lavenas, vice president. Anderson will represent the company's oil-field equipment and control


Loaded with VALUE!

OILCO

Oilco Loader No. 901

A new and simplified tank truck loading assembly, featuring economy, efficiency and dependability. Equipped with double ball bearing swing joint, and an unfailing SPRING COUNTER BALANCE, INSURING EFFORTLESS OPERATION. The unit includes a shockless loading line valve and telescopic sleeve. Sizes 2", 2½" and 3". Oilco always meets your needs in the realm of loading assemblies.

*Representatives in all leading cities*

OIL EQUIPMENT MANUFACTURING COMPANY
INCORPORATED
3100 VERMONT AVE. LOUISVILLE 11, KY.

DISTANCE ACCURATE

When towed from the rear of your vehicle, the Rolatape 600 is ideal for measuring leasehold improvements, pipe laying, exploration and many other needs. Can also be used by hand.

MEASURING IS FAST, WITH ROLATAPE 600

Get your long distance measuring QUICKLY and SURELY with the sturdy Rolatape 600. Precision calibrated for accuracy, the 600 automatically records measurements in feet as it is rolled along. Durable construction guarantees long, reliable service. Write today for full details.

1741 14th ST. ROLATAPE, INC. Santa Monica California

lines in the New York, Philadelphia, and Pittsburgh area. He will headquarter at Wayne, Pa. He has been a sales engineer in BS&B's domestic oilfield equipment division for the past 3½ years.

### McCollum Exploration Co. opens

V. K. Poland

. . . a new district in Tripoli, Libya, and assigned a Geograph crew there. District manager is V. K. Poland. He has been with McCollum Exploration since 1952 and has managed the firm's operations in both Calgary, Alta., and Midland, Tex. The Geograph crew is the first weight dropping crew to operate in that area.

### E. A. Kunnemann appointed

E. A. Kunnemann

. . . Mid-Continent sales engineer for H. C. Smith Oil Tool Co., according to Hal G. Bentson, chief engineer, sales. Kunnemann will service the entire Mid-Continent area for the company and will temporarily be located in Houston. For the past 4 years, he has been with Security Engineering Division, Dresser Industries, Inc. Prior to that he was with Hughes Tool Co.

### Jack C. Roberts transfers

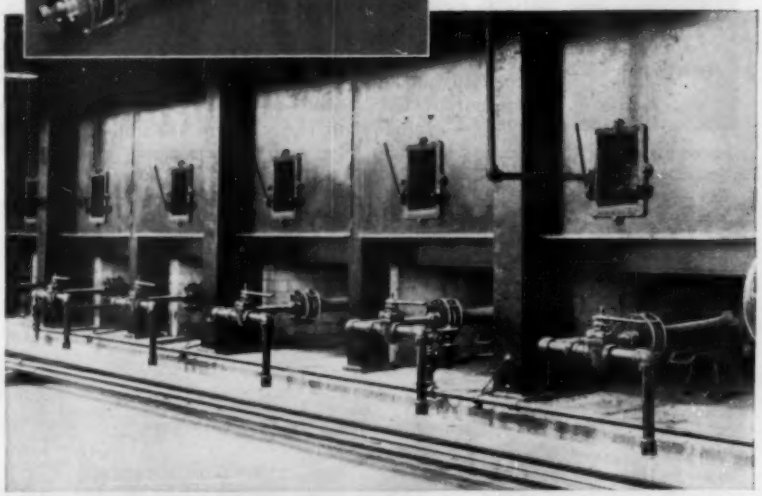
J. C. Roberts

. . . from Dallas, Tex., to the Houston headquarters of Wyatt Metal & Boiler Works, Inc. He is assistant manager of sales. Another change in Wyatt's organization is the selection of J. D. High as manager of Wyatt's new Corpus Christi plant. Roberts has been with the company since 1934 and High has been with Wyatt since 1933.

### GAI ships prospect equipment

. . . to be used in further exploration of wildcat territory in Turkey. The shipment includes 13 power vehicles, a host of trailers in the form of offices, workshops, general storage, etc., and a great deal of food. The Geophysical Associates International's seismograph crew there will be composed of 10 Americans and Canadians and supple-

**Gas Firing**
**FOR CENTER WALL UP DRAFT HEATERS**



**NATIONAL AIROIL**

**AIROCOOL Gas Burners**

National Airoil Burner Company's well known AIROCOOL Gas Burners have been widely accepted to efficiently up-fire all makes of center wall up-draft furnaces—heaters for various processes in numerous petroleum refiners extending around the world.

These venturi inspirating gas burners can be furnished with either single or twin nozzles to meet the customary flame-capacity performance.

National Airoil's exclusive AIROCOOL nozzles, figure #507 shown in the above burner photo, are supplied for high to medium molecular weight gases including natural gas.

Another popular advanced type is our HYDRO-COOL nozzle—not shown—which is universally used for hydrogen and other lower molecular weight gases that are prone to "flash back."

Regardless of the design of heater-furnace combination we have the correct gas or oil burner to fire it.

**National Airoil**
**BURNER COMPANY, INC.**

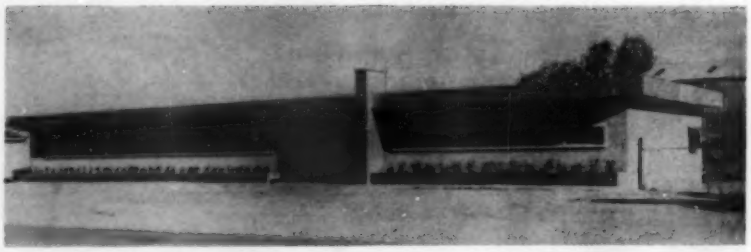
*Main Office & Factory:* **1236 EAST SEDGLEY AVE., PHILADELPHIA 34, PA.**

SOUTHWESTERN DIVISION: 2512 SOUTH BOULEVARD, HOUSTON 6, TEXAS

mented abroad by 35 Turkish workers. The crew is under contract to Socony Mobil Oil Co.

### Martin E. Roberts elected

. . . vice president and a director of The Lummus Co. Canada Ltd. He presently serves as manager of the Montreal, Quebec, office. He joined The Lummus Co. in 1946 as a process engineer. In 1954 he was assigned to The Lummus Co., Ltd., in London as a sales engineer.



### Master Tank & Welding Co. opens new office building

**. . . in Dallas, Tex. The 5,000-sq.-ft. structure is located on the 32-acre tract of land that headquarters the Dallas plant.**

### Milton R. Jordan assigned

**M. R. Jordan**

. . . as assistant district sales manager in the Houston area for Wire Rope Corp. of America, Inc., St. Joseph, Mo. He will make his headquarters in Houston. He will be working with Marshall Wildman, district sales manager for the Houston branch.

### Howard Bean joins

. . . Daniel Orifice Fitting Co. as flow measurement consultant. He was formerly with National Bureau of Standards, Washington, D. C. During his 40 years with the bureau, he served as physicist, chief of gas measurement instruments section, and chief of capacity, density and fluid meters section.


**Get to the HEART of your Building Problems...**

**NEED**

# SPECIAL ENGINEERING?

This compressor building, in extreme Southwest Texas required special layout, fast erection, special covering, particular lighting and ventilation, along with extra materials handling facilities.

Custom engineering at practically *mass* production costs! Braden's Special Engineering, using standard production procedures, provides:

1. Any width, length, height and layout, with rigid or standard steel framework.
2. Bay spacing as required.
3. Faster erection.
4. Elimination of unforeseen contingencies.
5. Permanent stability—yet almost 100% salvage value.

*Check Braden Buildings FIRST*

In the long run—Braden special engineered buildings cost less.

*Write for Braden Catalog.*

BRADEN STEEL CORPORATION

1007 EAST ADMIRAL TULSA 1, OKLAHOMA

ENGINEERS • FABRICATORS • ERECTORS

### International VCOF-405L joins

**. . . Halliburton pumpers in fracturing formation in a well in Bisti Field, Four Corners area, not far from Farmington, N. M. Newest and only unit of its kind among 85 trucks operated by Halliburton Oil Well Cementing Co. in the San Juan and Paradox basins, it mounts a 600-hp. diesel engine to drive its two high-pressure pumps. With its 257-hp. V-8 truck engine, equipped with a power take-off, it can deliver 857 hp. Equipment on this International Harvester Co. unit is custom designed by Halliburton.**

### Robert R. Herring elected

R. R. Herring

. . . to membership in the Young Presidents' Organization. Herring is president of Fish Service Corp. He will participate in the national as well as the Southeast Texas chapter. Founded in 1950, YPO has almost 1,200 members dedicated to making themselves better presidents and better men. Herring became assistant to the president of The Fish Engineering Corp. in 1950, and in 1952 became president of Fish Service. He is a former vice president of Pacific Northwest Pipeline Corp.; president of Valley Gas Transmission, Inc.; president of Fish Petroleum, Inc.; and president of Fish Service de Mexico.

### Waukesha Motor Co. appoints

. . . Southern Engine & Pump Co. as distributor for Roi Line engines, according to Cal Leavens, board chairman of Southern Engine. Waukesha recently purchased Le Roi Engines and renamed it the Roi Line. Southern Engine was for 20 years a distributor for Le Roi engines.

### Bethlehem Supply Co. announces

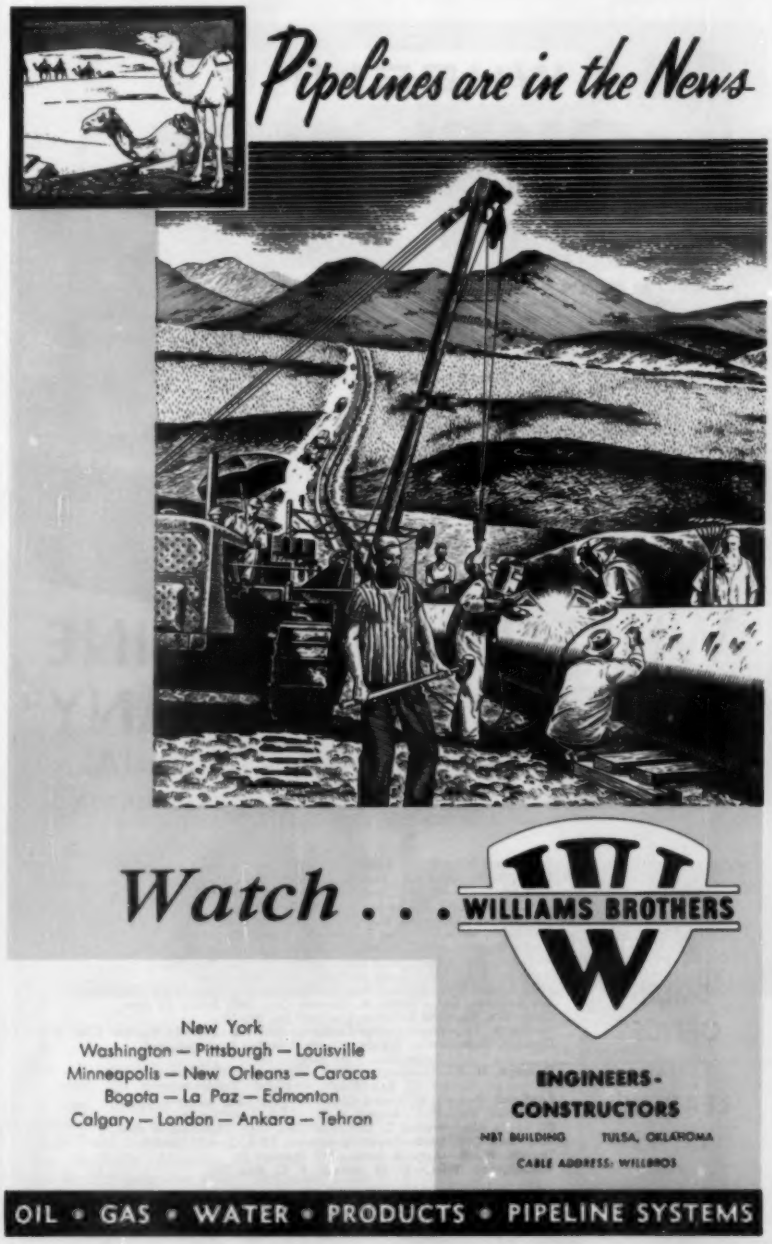
. . . a series of changes. J. M. Finger, store manager at Beaumont, Tex., transfers to the Beaumont shipyard of the Bethlehem Steel shipbuilding division in a sales capacity. H. R. Dooley, formerly chief clerk at Beaumont, replaces Finger. H. G. Nelson, formerly store manager at Alice, Tex., has been promoted to special representative and shifts to the Texas Gulf district office in Beaumont.

L. R. Muhlinghause, formerly special representative at Corpus Christi, Tex., shifts to Alice as store manager. R. M. Cox, formerly machinery sales representative at Shreveport for the Ark-La-Tex district is boosted to special representative there. R. A. Blair, formerly special representative for the Kilgore, Tex., store, is promoted to special representative for the Ark-La-Tex district to headquarter at Kilgore. B. D. Robbins, formerly machinery sales representative for the West Texas-New Mexico district at Midland, Tex., moves to the Rocky Mountain district office in Casper, Wyo.

G. H. Underwood, formerly store manager at Wichita Falls, Tex., moves up to local representative and is assigned to the North Central district office there. L. H. Ligon, formerly assistant store manager at Wichita Falls, has been promoted to store manager. B. D. Johnson, formerly floorman at Magnolia, Ark., is boosted to field representative and moves to Mineola. G. H. Ford, field representative at Sweetwater, Tex., transfers to the Abilene, Tex., store. R. J. Hebert, assistant store manager at Morgan City, La., transfers to the Houma, La., store. J. E. Guy, formerly floorman at Snyder, Tex., is promoted to field representative there. J. D. Lowry, trainee, transfers to the Houma store. D. W. Pipal, trainee at Snyder, moves to the Tulsa office. M. W. Burnett, formerly trainee, has been boosted to machinery sales representative and assigned to production equipment sales in Tulsa. C. E. Green joins the company as a machinery sales representative for the production equipment sales in Tulsa.

### National Supply Co. opens

. . . a building and yard for the sale of used oil-field equipment at Farmington, N. M. Stocks include drilling machinery, pumping equipment, casing tools, drill pipe, and casing. The



Pipelines are in the News
Watch . . .
WILLIAMS BROTHERS
New York
Washington — Pittsburgh — Louisville
Minneapolis — New Orleans — Caracas
Bogota — La Paz — Edmonton
Calgary — London — Ankara — Tehran
ENGINEERS-
CONSTRUCTORS
NBT BUILDING TULSA, OKLAHOMA
CABLE ADDRESS: WILLBROS
OIL • GAS • WATER • PRODUCTS • PIPELINE SYSTEMS

yard is also equipped to recondition engines and other machinery. Joe H. Dougherty is manager, under supervision of W. C. Hull, manager of used equipment sales for the northwest division.

### Royal W. Reiss appointed

. . . engineer in charge of the oil and gas operations of Aluminum Co. of America, with headquarters in Houston. He will report to Lawrence Litchfield, Jr., vice president. Reiss succeeds Louis W. Minturn. Reiss was with Humble Oil & Refining Co. prior to 1950 when he joined Alcoa as a production engineer.

### W. D. Helm named manager

. . . of the Chicago office of Century Electric Co. He succeeds Grant Hodgskiss, who has transferred to manage the Omaha, Neb., territory. Helm formerly was manager of the Milwaukee branch office. He joined Century in 1941. He has worked in the Atlanta, St. Louis, and Milwaukee offices during the past 17 years.

### Wilson Supply Co. transfers

. . . James Grady Ferguson from the Houston office to the sales office in Tulsa, where he will assist P. S. Stover, manager. Ferguson has been with Wilson 12 years. He is being replaced in the tubular goods department by Herbert Reimers. Reimers has been with the company for 17 years.

### Jones and Swift named

. . . in Motorola Communications sales moves. Harold A. Jones has been appointed vice president and eastern manager for Motorola Communications & Electronics, Inc., sales

H. A. Jones

R. N. Swift

and service subsidiary of Motorola, Inc. Robert N. Swift was elected to vice president and midwestern area manager to succeed Jones. Jones replaces Lowell E. White. Jones has been with Motorola for 12 years. Swift joined Motorola in 1952. He was formerly sales manager, special markets in the midwestern area.

### James H. Withers & Co. named

J. H. Withers

. . . as agent for Cameron Iron Works, Inc.'s, lift-plug valves on the West Coast. Withers was formerly a sales engineer with Cameron for 5 years. He has had experience in the pump, valve, and pipe industries in Oklahoma, Texas, and California. The office of the new agent is located in Long Beach, Calif.

### Don K. Reece joins

. . . White Advertising Agency, Tulsa, according to L. E. White, Jr. Reece previously served in the advertising department of Dowell division of The Dow Chemical Co.

### Walker-McDonald holds

. . . open house at the new plant in Greenville, Tex., according to L. M. Walker and R. E. McDonald. The Walker - McDonald Enterprises plant is located on a 10-acre tract. It was in complete production during open house and visitors were able to see the processes involved in the manufacture of rotary rock bits and Gold Digger insert bits. The new automatic heat-treating plant was also in operation.


WHEELING

COUPLINGS

FOR OIL COUNTRY USE

LINE PIPE COUPLINGS A.P.I.
⅛" to 12"—Seamless and Special Processed—Black or Galvanized

PLAIN TUBING COUPLINGS A.P.I.
1" to 4"—Seamless

EXTERNAL UPSET TUBING COUPLINGS A.P.I.
¾" to 3½"—Seamless

CASING COUPLINGS A.P.I.
½" to 13⅜"—Long or Short

HYDRAULIC COUPLINGS
⅛" to 4"—Seamless

REAMED AND DRIFTED A.I.S.I.
¾" to 12"—Seamless

DRIVE PIPE COUPLINGS
6" to 12"—Seamless

PIPE NIPPLES—All Sizes and Types

STEEL BUSHINGS AND PLUGS—3,000 Lb.

WHEELING MACHINE PRODUCTS COMPANY

WHEELING, WEST VIRGINIA

WEST COAST FACTORY: WOODLAKE, CALIFORNIA

SALES OFFICES IN LEADING CITIES

Baltimore, Md.—Frank Butler, 2301 N. Charles St.
Chicago, Ill.—Harry A. Jay, Suite 1090, Old Colony Bldg.
Denver, Colo.—W. G. Cline & Co., 4500 Kalamath
Detroit, Mich.—R. W. Lang, Jr., 505 Park Avenue
Erie, Pa.—R. J. Maggi, Box 711
Falmouth, Mass.—Walter S. Bennett, 5 Belvidere Road
Grand Rapids, Mich.—R. W. Lang, Jr., 138 Burton SE
Houston, Tex.—Henry H. Paris Distributor, Inc., Box 932
Independence, Mo.—Craig A. Fross, 3701 Norwood
Long Island City, N. Y.—Max Rothenburg Co., Inc., 11-05 38th Ave.
Los Angeles, Cal.—James A. Riordan Co., 1400 Santa Fe Ave.
Louisville, Ky.—Sid Schultze Co., 849 So. 6th St.
Narberth, Pa.—Worthington-Grothaus and Assocs., 105 Forrest Ave.
Omaha, Nebr.—Wm. Freiden, Central States Engineering & Sales Co., 5101 Blondo St.
Oswego, N. Y.—Northeastern Associates, Neil Chatterton, Sec'y., P. O. Box 284
Portland, Ore.—J. G. Beard Co., 1233 NW 12th Ave.
Richmond, Va.—P. C. Abbott & Co., 15 E. Franklin St.
St. Louis, Mo.—Walter C. Dollinger Co., 4869 Goodfellow Ave.
Salt Lake City, Utah—Lovell Company, 29 E. 2nd St. South
Seattle, Wash.—Ashe & Jones, 819 Thomas St.
Wauwatosa, Wisc.—W. G. Nelson, P. O. Box 203

QUALITY-CONTROLLED PIPE COUPLINGS SINCE 1918

PROTECT

F-M Type Z C engines from burn-up due to low oil level

*New!*

MODEL L-125
Sight-Level Gauge Switch

$9.75
Easy to install

FRANK W. MURPHY MANUFACTURER, INC.
RANCH ACRES STATION
TULSA, OKLAHOMA
MURPHY SAFETY SWITCH OF CALIFORNIA
11812 Davenport Road • Los Alamitos, Calif.

WHY PAY LEASE RENTALS THE HARD WAY?

NEW Kraftbilt COMBINATION RENTAL CHECK . . .

- eliminates extra writings . . .
- ends errors in transcribing . . .
- prevents errors of omission . . .

Now in ONE writing on KRAFTBILT Rental Checks
You complete the entire group of forms needed in rental paying procedure.

FREE Write for simplified rental payment procedure No. 298-J and sample lease rental check set.

ROSS-MARTIN COMPANY
P.O. BOX 800 TULSA 1, OKLAHOMA

### Bethlehem Supply Co. announces

. . . the relocation of the Texas Gulf district headquarters from Houston to Beaumont, Tex. O. H. Crowe, Texas Gulf district manager, has also moved to the new location. This district now comprises the store areas of Lake Charles, La., Beaumont, and Houston.

### T. P. Tarwater named

T. P. Tarwater

. . . president of CP - Harrisburg, Inc., Fort Worth, Tex. Ken W. Davis, former president, is now chairman of the board. Tarwater was formerly general manager of sales of Mid-Continent Supply Co. CP-Harrisburg was recently organized as a distributor of the oilfie d equipment manufactured by Chicago Pneumatic Tool Co.

### Infilco, Inc., expands

. . . its facilities and services and promotes three, according to E. G. Kominek, vice president and general sales manager. C. T. VanderMolen has been appointed assistant sales manager with direct supervision of the sales engineering department. H. W. Frazer, formerly manager of the demineralization division, has been promoted to the new position of industrial project manager. A project engineering department has been organized under the direction of L. H. Piper.

### Compressor layout saves space

**. . . at a large eastern refinery. A duplex system, it consists of eight two-stage Fuller Co. rotary air compressors, hooked up in twos and direct-driven by four 700-hp. General Electric Co. motors. Supplying the refinery base air load of 13,200 c.f.m., the Fuller duplexes compress air from atmosphere to 115 psig. for tools, machinery, air lines, and other pneumatic uses. Operation is automatically controlled and the units are lubricated by force-feed systems.**

McDONALD PRODUCTS
*Safety Designed...*
with comfort in mind!

*Whenever* INSTANT FIRST AID *is needed!*

McDonald

kanister kit

Instant help in dangerous situations! Weatherproof container mounts anywhere—on trucks, posts, trees, in the plant. Snaps open to release roll-up kit containing complete first aid assortment. Kit drapes over arm for easy, antiseptic, self-treatment.

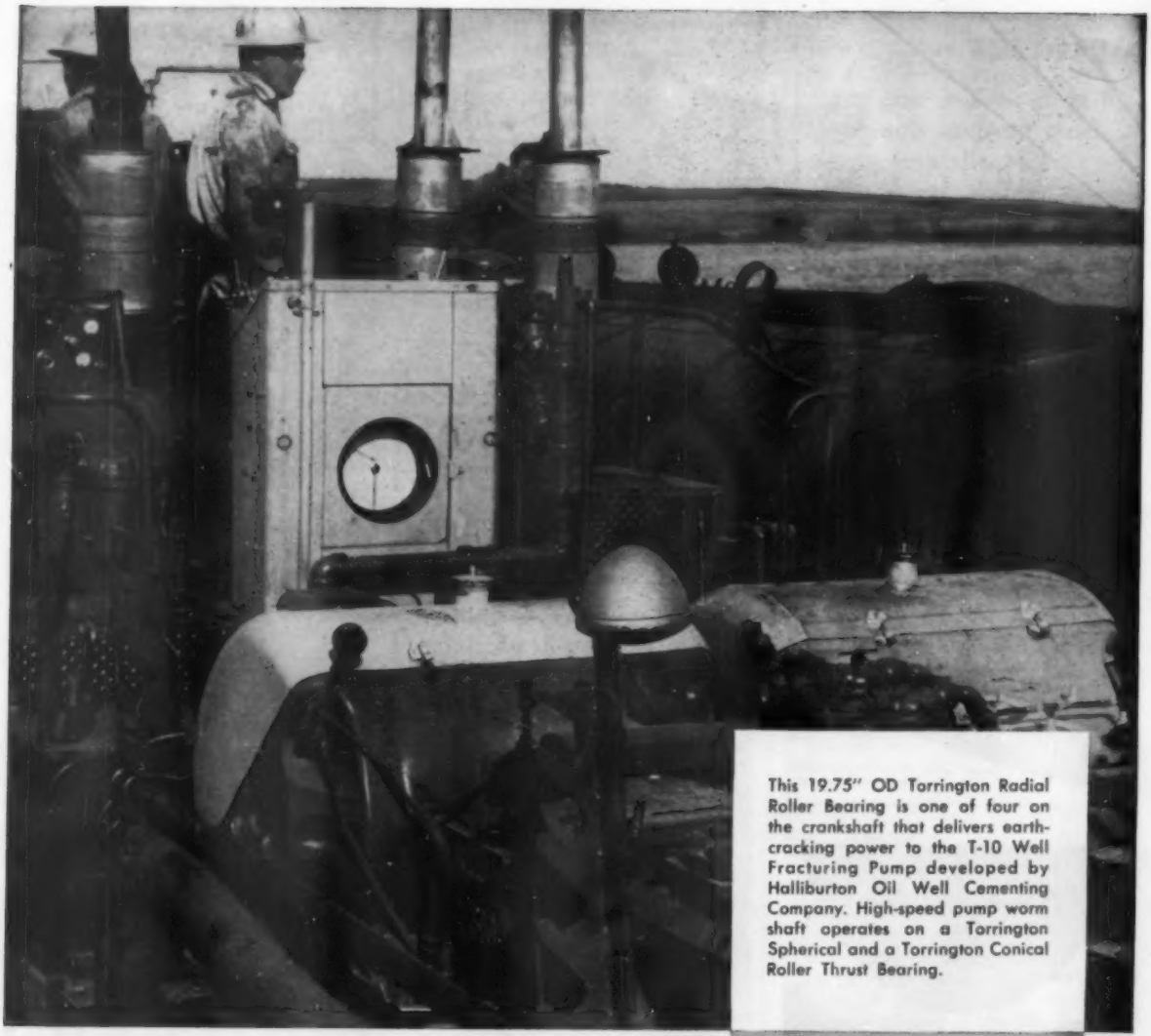
*Send coupon today for information and prices*

Safety FROM HEAD TO FOOT
B-F-McDonald Co.
Manufacturers & Distributors of Industrial Safety Equipment

5721 WEST 96th ST., LOS ANGELES 45, CALIF.
3745 Greenbriar Dr., Houston 6, Tex.
Distr. in Canada by Mine Safety Appliances Co. of Canada, Ltd.

Please send information and prices on McDonald Kanister Kit.

NAME_____
FIRM_____
ADDRESS_____
CITY_____ STATE_____



This 19.75" OD Torrington Radial Roller Bearing is one of four on the crankshaft that delivers earth-cracking power to the T-10 Well Fracturing Pump developed by Halliburton Oil Well Cementing Company. High-speed pump worm shaft operates on a Torrington Spherical and a Torrington Conical Roller Thrust Bearing.

## Controlling a man-made earthquake!

Millions of barrels of oil are being added to our recoverable resources by "fracturing"—a controlled, man-made earthquake. Sand-carrying fluid is pumped into a well with enough pressure to crack and enter a formation. Sand remains to prop open the new fissures.

Pressure is applied through a Halliburton T-10 Well Fracturing Pump. Mounted on the crankshaft of this pump are four Torrington Radial Roller Bearings. There they render dependable service and meet the demanding requirements of severe space and weight limitations.

The precision construction, quality steels and skilled heat treatment that go into Torrington Bearings have made them rugged, dependable performers in all types of oil-field equipment. Call on your Torrington representative for engineering service in the application of anti-friction bearings to your heavy-duty equipment. **The Torrington Company, South Bend 21, Ind.—and Torrington, Conn.**

**TORRINGTON BEARINGS**

*District Offices and Distributors in Principal Cities of United States and Canada*

SPHERICAL ROLLER • TAPERED ROLLER • CYLINDRICAL ROLLER • NEEDLE • BALL • NEEDLE ROLLERS • THRUST

# Another Kansas corner quickens

BY FRANK J. GARDNER

LAST WEEK this column emphasized that a new era in Kansas exploration may be under way in the northwest corner of that state. Today, let's look at the southwestern corner where something new is brewing.

This is not a new province by any means. Here are the vast Hugoton, Greenwood, and other Permian gas fields. This is the northern extension of the world's greatest gas field.

But now, after years of complacence about what might underlie this huge blanket of gas, Hugoton operators are beginning to probe the pre-Permian formations. They've been pleasantly surprised at what they've found, for the deeper rocks are paying off handsomely in oil.

**A pipeline arrives . . .** Now the Jayhawk pipeline has arrived in the area, and with the prospect of gathering lines throughout southwestern Kansas, you can look for a hum of deep-drilling activity throughout the nine counties shown on the map.

Let's take just one of these field developments and see what's happened: Pleasant Prairie, Northwest Pleasant Prairie, and South Side fields in T26 and 27s, R34 and 35w, will be the guinea pig.

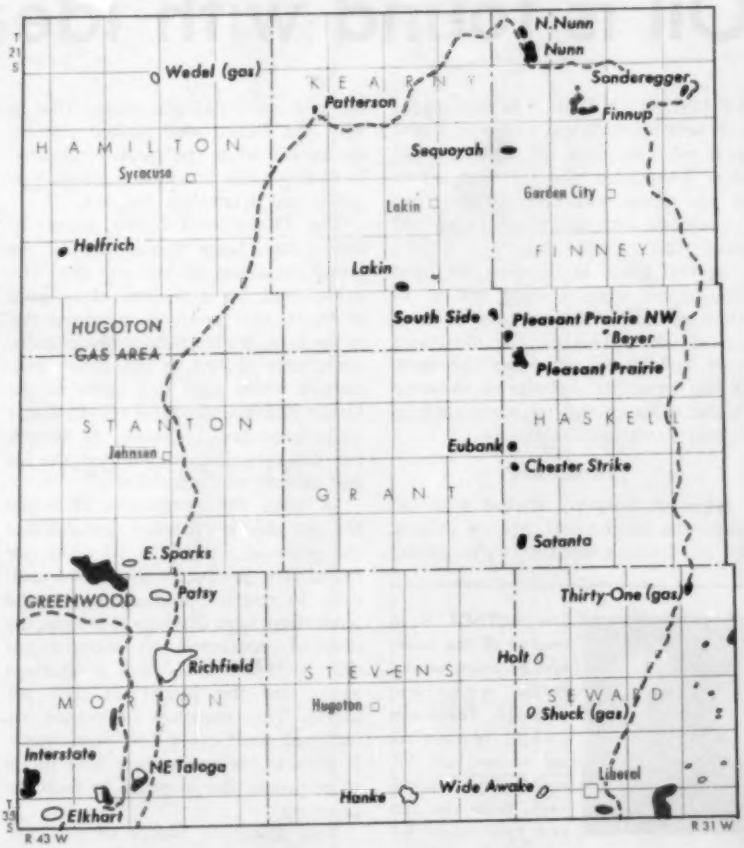
Way back in 1954, geologists at Helmerich & Payne, Inc., decided to see what might lie underneath the Hugoton gas blanket. Wasn't it just possible that the many structural expressions in the Permian beds might carry on down through the section? The H. & P. staff agreed to find out. The Permian reservoir at 2,700 ft. was just about drilled up.

H. & P.'s 1 Jones, the first deep effort, was a whopping success. It tapped a fine Mississippian oil pool at 5,100 ft. and pumped 167 bbl. a day of 37° - gravity crude with no water; it gave Haskell County its first oil well. This was the discovery well of Pleasant Prairie field. Since that first strike, the operators have drilled 19 wells and scored 19 producers. In the process, they've outlined three separate closures in the Mississippian. But more important, they've confirmed their theory that the Permian structure is indeed reflected in the deeper rocks.

**To good development . . .** Because no pipeline tapped the field, H. & P. has been lackadaisical in its development program. But now a minimum of 86 proven locations in the three fields is envisioned. Two rigs are kept busy. Although the developers are a bit coy about committing themselves, it's a pretty safe bet that all 86 will be drilled, and that similar development programs will pop up all over southwestern Kansas.

The first 80-acre spacing pattern in Kansas has evolved here, and Jewell Ogden, director of conservation for the Kansas State Corporation Commission, considers this as Kansas' most important achievement of 1957. As a result of this development, the allowable for Pleasant Prairie area wells was boosted from 40 to 65 bbl. per day.

All these wells are pumpers, producing from a solution gas-drive reservoir with low gas-oil ratios. The oil averages 35° gravity with a base price of $3.10. Derby Crude Oil Purchasing Co. is taking the oil at Meade station at a posted price of $2.90. Each well now costs about $70,000 into the tanks; this is down $10,000 from the first one or two wells put down.




**ARRIVAL OF A PIPELINE** in southwestern Kansas' Hugoton embayment will stimulate a brisk drilling campaign in the next few years, aimed at the pre-Permian oil pools now known to lie beneath the vast Hugoton gas blanket.

**In many new pays . . .** The really bright outlook for Hugoton is enhanced by a multiplicity of pay horizons. Besides two zones in the St. Louis-Mississippian, production has been discovered in the Cherokee, Morrow, Lansing - Kansas City, Toronto, and Chester. Eubank field, incidentally, is the only Chester oil producer in the entire Hugoton embayment, and the recent discovery of a second Chester reservoir, 2 miles south of Eubank, lends encouragement to the search for oil in that formation.

So the entire western third of Kansas can be expected to bristle with drilling rigs over the next few years. The play in the northwest and the search in the southwest will combine to keep it busy at least until 1965.

(Note: A structure map of the three fields reviewed here may be found on page 293 of this issue).

## Knowledge, skill and experience are important, but . . .

# Oil is found with ideas

BY PARKE A. DICKEY

WE USUALLY find oil in new places with new ideas. When we go to a new area we can find oil with an old idea. Sometimes also we find oil in an old place with a new idea, but we seldom find much oil in an old place with an old idea.

Several times in the past we have thought we were running out of oil when actually we were only running out of ideas. This can be illustrated most vividly by reviewing the story of the principal discoveries in some of the older producing areas such as Pennsylvania and Oklahoma.

### Pennsylvania

The oil business started with an idea—the mechanical one of drilling for oil. Drilling was the key to getting oil in commercial quantities. That is why the Drake well started the industry off when the small-production hand-dug wells in Ontario, West Virginia, and Kentucky did not.

The Drake well bailed about 10 bbl. a day. Later it was put on the pump for about 25 bbl. per day. The driller had hit a shallow stray sand at 60 ft. that produces nowhere else in the area. Within a very few months, wells were drilled to the richly productive Third sand just north of the Drake well at a depth of 400 ft. These wells produced hundreds of barrels per day, flooding the limited market and driving the price down.

In 1861 the production of 6,000 bbl. per day so exceeded demand that the price of oil fell to 10 cents per barrel. The producers tried unsuccessfully to restrict production, but the wildcatters kept drilling. However, the demand continued to increase—so that by 1864 there was a shortage again and the price was $10 per barrel. This sequence of events has repeated itself every few years since. It is lucky we never were able to restrict production in order to keep the price up.

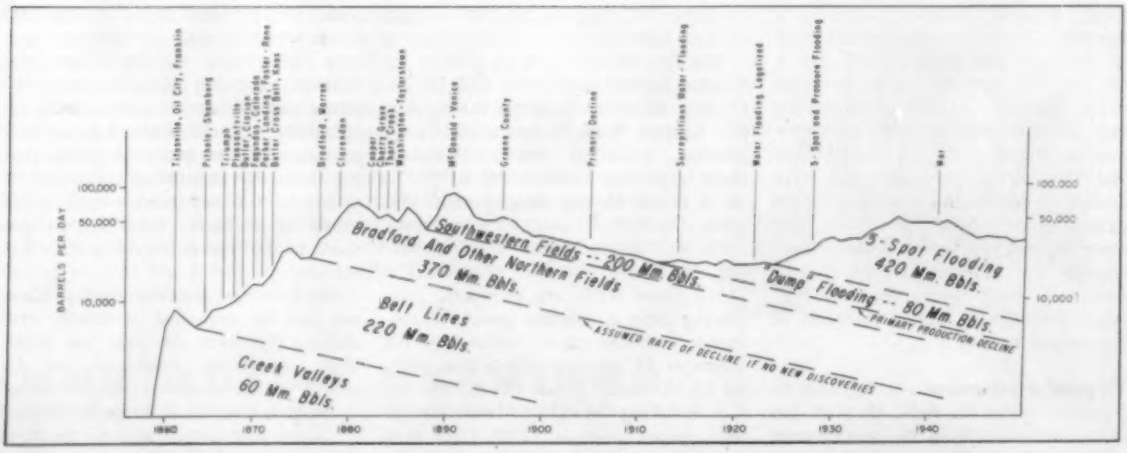
Ten dollars a barrel seemed like prosperity to the Titusville oil men, but if they had been successful in keeping the price high with respect to other costs, crude might be selling for $60 and $76 per barrel today. If this had happened we would be selling thousands of barrels of oil for lubricating oil and kerosine instead of millions of barrels for motor and heating fuel.

**New ideas in Pennsylvania . . .** The effect of new exploration methods is shown in the daily oil production of Pennsylvania, which is plotted in Fig. 1 on semilogarithmic paper. On this paper, equal per cent increases show as equal rises on the curve, and a constant per cent decrease per year plots as a straight-line decline. When no new oil is being found, production declines often are approximately straight lines on semilogarithmic paper. Therefore, if the rate of decline is known, a rough idea of the amount of oil discovered by each new development can be obtained.

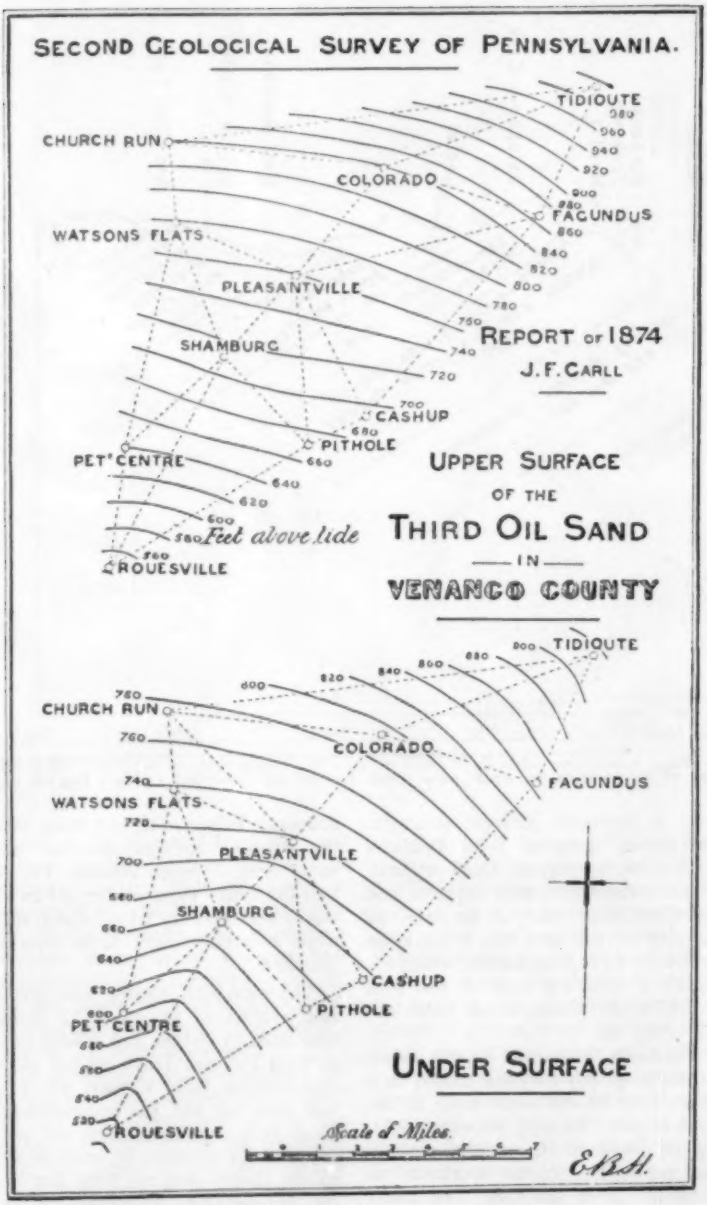
Each new area or each new idea on where or how oil may be found is followed by a burst of discovery, each greater than the last. In a surprisingly short time, the field is drilled up, the method is exploited, and production declines until a new idea or area is discovered. In Pennsylvania a pattern was set that has since been repeated in other states. We find oil by new methods in new areas.

**Creekology . . .** Oil finders of that day, like those of today, looked for oil in places that resembled those in which it had previously been found. They therefore first confined their wildcatting to the narrow deep valleys that dissect the high forested Alle-

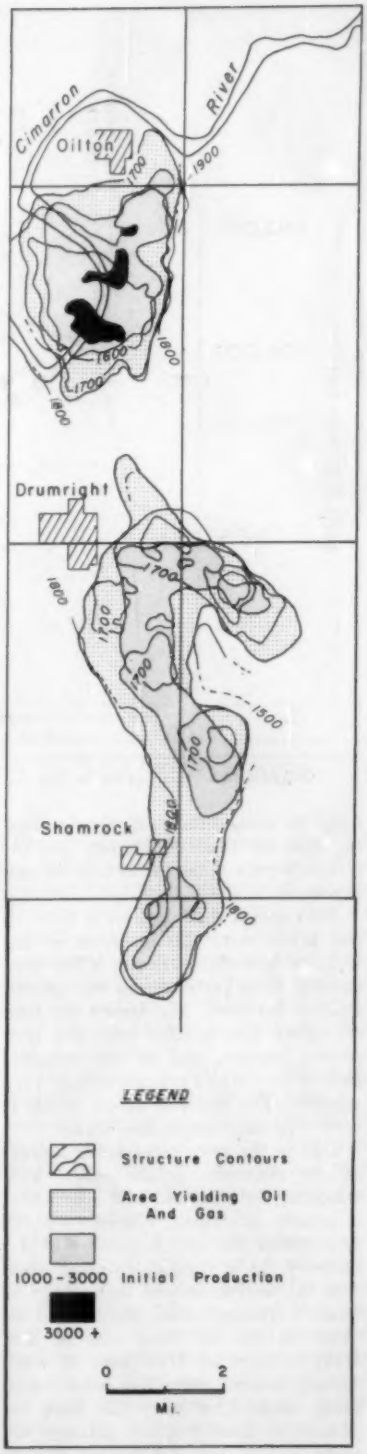
THE AUTHOR is in charge of the western division, exploration section, Creole Petroleum Corp., Maracaibo. He is on an 18-month loan assignment from the Jersey Production Research Co., Tulsa, where he is manager of the geological division. He received his Ph.D. from Johns Hopkins University, and has had considerable experience in oil exploration, both domestic and foreign. He is president of the Tulsa Geological Society, and is active in the AAPG.




**EACH** new idea boosted Pennsylvania's output. Notice, however, that 30 years after the Drake well almost all of Pennsylvania's primary production was tapped. Fig. 1.




**THE FIRST STRUCTURE MAP** of an oil field was published by the Pennsylvania Geological Survey in 1874. Fig. 2.



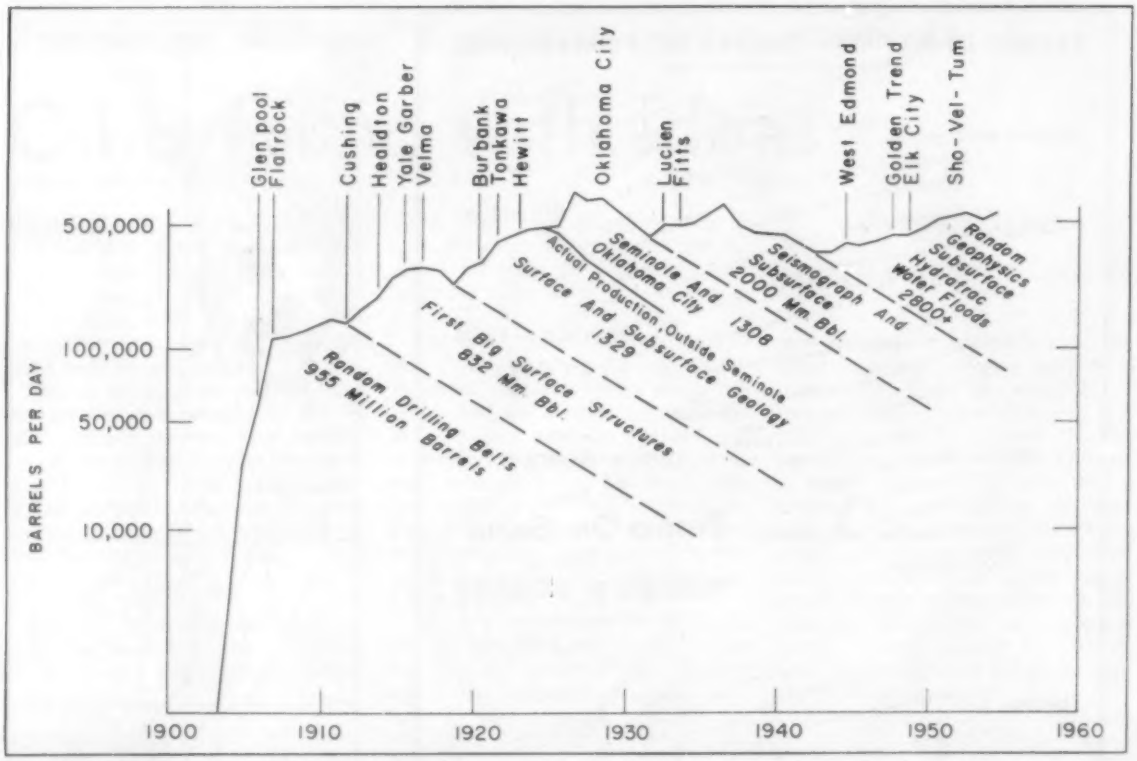

**CUSHING,** a known surface anticline, revived the anticlinal theory and touched off a wave of discoveries that tapped many of the large structures in the Mid-Continent. Fig. 3.

gheny Plateau. They found much oil along Oil Creek downstream from Titusville, but none above.

Down the Allegheny River they found the Reno and Franklin fields. Up the Allegheny they found little oil until they got to Tidioute, where the Third sand is coarse and pebbly and only 150 ft. deep. This first burst of drilling in 5 years discovered about 60 million barrels of high-gravity low-sulfur oil.

It was not until about 1864 that a venturesome operator, probably contrary to the best advice of the experts, drilled a well on the Old Ocean farm on a hilltop west of Oil Creek. He hit a rich streak of Third sand, and started a new burst of development which caused some famous booms. Pithole was a shortlived boom where the wells were drilled so closely and cased so poorly that the sand was virtually exhausted and watered out in a year. But many other fields were found under the hilltops.

**Trends . . .** As drilling proceeded, it became apparent that the oil fields lined up in long, narrow belts and trends. This must have been noted by many operators, but the most astute and literate was C. D. Angell,[1] who owned a lease at Scrubgrass in the Allegheny River valley, which is here very narrow. He noticed a similar small spot of production up the river at Foster. Although not a geol-




**OKLAHOMA,** too, came in for its cycles of discoveries as each new idea turned up new oil fields. Fig. 4.

ogist, he studied the well records, finding that the sand thicknesses and intervals were similar at Scrubgrass and Foster.

He decided that they were both on the same belt. Having faith in his idea, he had engineers run a line connecting these pools across the plateau east of the river, and leased the land on either side of this line. His idea proved correct, and he was wonderfully successful, becoming very wealthy. The linearity of oil trends is very well marked in this area.[2]

One of the most remarkable aspects of oil discovery is the speed with which all the oil found with a new idea is usually developed. Within 10 or 15 years from the very beginning of the industry, in a rugged, forested area, with no well-developed technology or modern transportation, they found almost all the oil there was in that area. In spite of 100 years of wildcatting, almost none has been found there since. This story has been repeated in most but not all new oil areas.

**The first structural map of an oil field . . .** The Second Geological Survey of Pennsylvania was organized in 1874 under the direction of J. P. Lesley. In his previous career in coal geology he had shown the importance of quantitatively contoured topographic maps and had introduced contours to represent geologic structure. The survey assigned John Franklin Carll to the oil regions. Carll originally was trained as a civil engineer and had spent some years in the area. At the end of the first year's work he published a progress report, which included a structure map of the area in which the principal oil fields occur[3] (Fig. 2).

The fields themselves are not shown on this map, but they are shown on a larger map to the same scale in the same report. The map shows no folding or faulting, but a very smooth and gentle dip to the southwest of about 20 ft. to the mile. The linear character of the oil pools was by now well established and Carll refers to them quite naturally as "belts" and "leads."

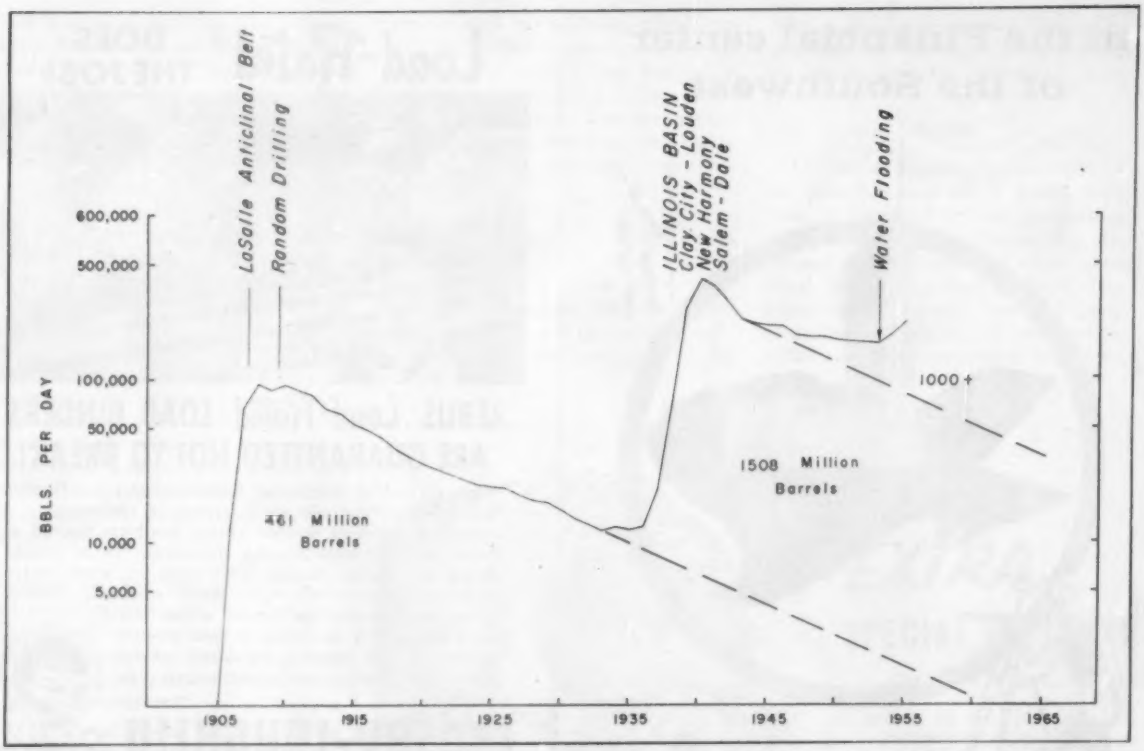
**The anticlinal theory . . .** In the meantime, oil had been discovered in western Ontario at localities that Geologist T. Sterry Hunt recognized as anticlinal.[4] E. B. Andrews, of Marietta, Ohio, noted oil seeps and some producing oil wells along the sharply folded Burning Springs anticline in western West Virginia. He reasoned that oil occurred[5] in fissures, and that the sharp folding favored their formation, while the flat-lying rocks to the west lacked fissures and therefore were barren.

The Ontario fields have had some economic importance, but those along the Burning Springs anticline have never been of much account. For the first 50 years most of the oil in the world was coming from stratigraphic traps in areas where there were no anticlines.

The structural theory was revived and applied to gas by I. C. White[6] and later by White and others to oil in West Virginia. There are big, closed structures in West Virginia which affect both oil and gas accumulations. Even here, however, most oil pools are strongly affected by sand lensing, so the theory was not very useful in oil prospecting. However, it was notably successful in prospecting for gas during the big expansion of the natural-gas industry which occurred around Pittsburgh starting about 1882.

The Lima-Indiana fields, which were the next great oil fields after Pennsylvania, were not on well-defined anticlines, although Orton[7] pointed out later that their gas, oil, and water lay at definite structural elevations. The anticlinal theory remained unused by oil men, primarily because it did not apply to the principal oil fields of the time, and obviously could not be used to find oil in those areas.

Carll later wrote a more comprehensive report on the "Geology of the Oil Regions,"[8] which may be re-




**THE EFFECT** of new ideas is clearly evident in Illinois. Seismic work was responsible for the Illinois basin play between 1937 and 1945. Fig. 5.

garded as the foundation of both petroleum geology and engineering. It has not received the recognition it deserves. Carll saw the need for keeping careful records and examining samples; he explained porosity and permeability; he explained the role of gas and water in expelling oil from the reservoir, and described secondary recovery by water flooding.

Oil production in Pennsylvania increased pretty steadily until 1881. Most of this increase was due to the gradual development of the Bradford field, the largest in the state. When it was drilled up in about 1880, the inevitable decline set in. Since 1891, there have been no major discoveries in Pennsylvania, inspite of much wildcatting, some of it quite deep.

The reason is geological—there are no good reservoir rocks between the Devonian in which the oil and gas occur, and the Ordovician which is deeper than 10,000 ft. and is still mostly beyond reach of the drill.

**Water flooding . . .** From 1899 to 1912, production gradually declined from 85,000 to 21,000 bbl. per day. At this point there is a distinct break in the curve (Fig. 1). Soon after their discovery most of the older fields were flooded by water from leaky casings or improperly plugged wells, and this water was naturally considered very harmful. Laws against admitting water to the oil sands were passed in the 1880's. For some reason, possibly because of its more orderly development and slower decline, this watering-out had not taken place at Bradford.

There it was found that if the casing were ripped or pulled so that the abundant ground water could enter the sand, the oil production of neighboring wells was increased. No one would admit to doing this, however, until water flooding was legalized in 1922. Water flooding at Bradford boosted Pennsylvania's oil production from 1920 to 1954, then a new steep decline set in.

### Oklahoma

Kansas wildcatters drilling the shallow stratigraphic shoestrings and lenses of sand in the Cherokee shale worked their way into Oklahoma (then Indian Territory) about 1900. The oil-production curve from Oklahoma is shown in Fig. 4.

The Bartlesville, Nowata, Delaware, and Alluwe fields were discovered by random drilling and by following the same northeast-southwest trends the drillers had learned in Pennsylvania. The really big discoveries came with Bird Creek, Flat Rock, and finally Glenn Pool in 1905, with a peak production of 117,000 bbl. per day in June 1907.

**Reenter the anticlinal theory . . .** That anticlines are favorable places to find oil became spectacularly evident with the discovery of the Cushing field in March 1912 (Fig. 3). Cushing is a prominent north-south anticline with three separate domes. It was mapped on the surface by W. S. Woodruff and his son in March 1911 for Hill Oil & Gas Co.[9]

The discovery well was drilled by Shaffer & Smathers in March 1912 without the aid of geology. Development was rapid during 1913 and 1914, but the pool was so big that the peak rate of 305,000 bbl. per day was not reached until 1915.

In May 1914 the Oklahoma Geological Survey published a structure contour map of the surface geology of the Cushing field by Frank Buttram and others. It showed that the subsurface contours and the line separating the oil from the water paralleled the surface structure contours, and it made a big impression on many producing companies.

The discovery of the largest field yet found in Oklahoma, and probably in the world at that time, on a well-known structure easily mappable from the surface, established geology in the oil business, and furnished the idea on which most scientific discoveries were based for the next 15 years.

In a very few years all the big

## in the Financial center of the Southwest

## REPUBLIC is the Oil Man's Bank

In drilling or financing, it's *results* that count . . . and more and more oil producers are finding the right results through financing in the Oil Department of Republic National Bank of Dallas . . . a pioneer oil bank of the Southwest . . . where your production financing needs are met by men who know the oil industry. Take *your* next problem to Republic . . . the oil man's Bank.

*CAPITAL FUNDS OVER $90,000,000 LARGEST IN THE SOUTH*

**REPUBLIC National BANK of Dallas**

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

## Load-Rated* DOES THE JOB!

## LEBUS Load-Rated LOAD BINDERS ARE GUARANTEED NOT TO BREAK!

It's a fact! If a *100% drop forged* Lebus Load Binder breaks in *normal use* we'll replace it. Strength . . . safety of this heat treated binder has been proved in tough drilling and logging industries. Once locked down, the Lebus handle can't snap up, even under shifting loads—won't open until released. Shifted loads can't freeze the binder either. Examine this 100% drop forged heat treated binder at mill supply, industrial or construction equipment distributors—or write:

*Trademark

**CROSBY-LAUGHLIN Division**

AMERICAN HOIST & DERRICK COMPANY

FT. WAYNE 1, INDIANA

DAY AND NIGHT, Geolograph Recorder "remembers" all the data you need while the well is drilling. This is our "5th of a Century" Anniversary, and you are assured the GEOLOGRAPH RECORDER is the best in *all* ways . . . *always!* You'll find Geolograph Service just as superior as the GEOLOGRAPH RECORDER!

GEOLOGRAPH RECORDERS combine exclusive, unique "TRIP ACTION" and "MAGNA-SENSOR" features.

Contact your local GEOLOGRAPH office.

**GEOLOGRAPH®**

OIL FIELD SERVICES

P. O. Box 1276 • Oklahoma City 1, Okla.

structures mappable on the surface were discovered, and from 1918-22 production was off. The U. S. Geological Survey sent a group of men to map Osage County about 1920.[10] These geologists and their new and detailed techniques spread throughout the state and their work resulted in a new wave of discoveries based on, or at least strongly influenced by, geological thinking of a somewhat more profound and intensive nature than the search for simple surface anticlines.

Another and larger burst of discoveries took place, culminating in the enormous discoveries of the Seminole area in 1926 and 1927, and Oklahoma City in 1928 and 1929. While the discoveries at Seminole and Oklahoma City pushed up the state's production, the older fields declined rapidly, as shown in Fig. 4.

**Burbank . . .** But the geologists were too much carried away by their enthusiasm for structure. For example, they took credit for discovering Burbank field, which really should have been credited to random drilling. In May 1920, Marland Oil Co. drilled the discovery well of Burbank in a small dome it had mapped on the surface with the plane table.

In September of the same year, Carter Oil Co. drilled another discovery on a small anticline 3½ miles to the southeast. Either company could have discovered the pool just as well by drilling the intervening syncline, and the biggest wells of all were several miles from the highest point structurally and 100 to 150 ft. lower.

The sand body is a large shoreline type sand and its location could not then, or now, be predicted from surface geology. The apparent impossibility of predicting the location of lenticular sands made the geologists overemphasize the role of structure, because the latter could be found from the surface. The advent of geophysics further emphasized the role of structure so that geologists almost forgot about stratigraphic traps.

Production in Oklahoma rose from 238,000 bbl. per day in 1919 to 760,000 in 1927, while the price fell steadily during the same period from $2.75 to $1.30. This period of falling prices coincided with a fantastically rapid increase in production. The reason, of course, is that the rapid discovery affected the price, rather than vice versa. Oil is found by new ideas rather than by high prices.

**Seismic results . . .** The seismograph was introduced into Oklahoma in the early 1930's. Although it resulted in many discoveries it did not have the great success in Oklahoma that it had in Texas. The larger structures all show on the surface, and had previously been found. Some of the smaller structures discovered with the seismograph were dry because the sands, being so often lenticular, were not present.

**Subsurface geology . . .** A new series of discoveries began in 1944 and has continued to the present. The main cause has apparently been improvements in the use of the seismograph, especially better interpretation of the data in the light of subsurface geology. Random drilling and accidental discoveries are still important, however.

### Illinois

The most remarkable example of the principle that oil is found with ideas is exhibited by the production curve of the State of Illinois (Fig. 5). Oil was found along the LaSalle anticlinal belt at Westfield in 1904. The boom spread rapidly, and the peak of drilling was reached in 1907, when 4,988 wells were completed. Peak pro-

EXTRA

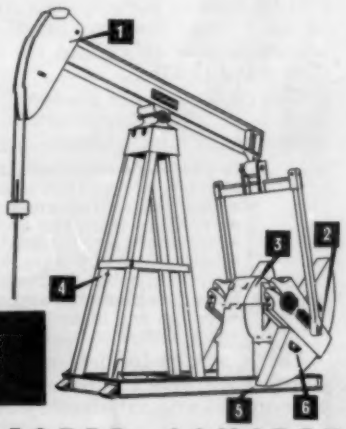
SPECIAL FEATURES

The more distinctive and original the facial adornments of this New Guinea tribesman the more important he becomes in the eyes of his fellows. The character illustrated is wearing the Australian Government's Service Medal on his brow, and the cap badge of a shot down airman is his cowrie headband. Many other adornments from wrecked Allied and Japanese aircraft are worn to give distinction to the owner.

Much more appreciated by oilmen in the field are the extra special features of the Le Grand Pumping Units which make them so rugged—dependable—reliable.

Note these outstanding features:

1. Swing back mulehead provides ample well clearance for well servicing. Mulehead retaining bolt operated from samson post.
2. Patented wrist pin for ease of changing stroke; no seizure occurs requiring hammering or burning out to remove.
3. Double reduction, double helical gears with anti-friction bearings throughout.
4. Inbuilt oil reservoirs provided in bearings with lubrication points at shoulder level throughout, using one grade of oil throughout.
5. All units have floor clearing cranks.
6. One man operated counterbalances in one horizontal setting of the cranks.




LE GRAND

LE GRAND ROCHESTER LIMITED

Hersted Airport • Rochester • Kent • England

Telephone: CHATHAM 44626

Also represented in the following countries:

CANADA: Le Grand Ltd., 111-38th Avenue South West, Calgary, Alberta
IRAQ: Le Grand, Sutcliff & Gell, Ltd., Attar St., Karrada, Sharquiyah, Baghdad
TRINIDAD: Industrial Agencies Ltd., 14, High Street, San Fernando, Trinidad, B.W.I.
VENEZUELA Eastern: A-Z Export, S.A., Apartado 4062, Puerto La Cruz, E. Venezuela
VENEZUELA Western: A-Z Export, S.A., Apartado 304, Maracaibo, W. Venezuela

duction was reached the following year.

By 1911 most of the major pools in the LaSalle uplift area were found. Large reserves only a few miles to the west and only a few thousand feet deeper lay undiscovered for 20 years. The curve shows a smooth decline from 1911 to 1933.

Bell ascribes a reawakening of interest in the Illinois basin to the discovery of Mount Pleasant field on an anticlinal fold in the deepest part of the Michigan basin in 1928.[11] A paper read by him in 1931 pointed out the significance of this discovery. The Illinois Geological Survey consistently maintained that there were important oil possibilities in the deeper parts of the Illinois basin.

**Seismic results . . .** It was not until the late 1930's that seismograph surveys located apparently favorable structures. In 1937 Patoka and Clay City were discovered. An active leasing and drilling campaign followed and many large pools were discovered in the next few years. Production in 1940 reached a peak of 400,000 bbl. per day. Continued active prospecting for stratigraphic traps maintained production pretty well until 1953. Water flooding of the Patoka pool started about 1940 and of Siggins pool in 1942. It was slow in catching on, however, and although secondary production became appreciable in 1946, it was not until 1953 that water flooding amounted to a considerable fraction of the total production. Production in 1954 and 1955 increased rapidly as the large pools, Louden and Salem, were placed under flood.

The 20-year cessation of oil discoveries in Illinois is most unusual. Oil discovery in other states has come in cycles, each dominated by a new method or a new area. These followed each other with a pause of only a few years. In Illinois the hiatus between cycles lasted for 20 years during which almost no oil was discovered.

It is interesting to inquire into the reasons for this period of stagnation. Many shallow holes had been drilled in the basin area and it was supposed that they had condemned it. Ver Wiebe[11] said in 1930, "During the years from 1889 to date so many scattered wells have been drilled in the Eastern Interior Coal basin province that no hope remains for any large pools."

The oil sands that produced on the LaSalle anticlinal belt were found to contain salt water, and it was assumed that they, and the deeper Chester sands also, would contain salt water all across the basin. This idea was explained and fortified by the anticlinal theory which became widespread in the oil industry about this same time.

It was also believed that the carbon-ratio theory propounded by David White[12] made the deep basin an unfavorable area in which to prospect. The scientific theories which were fashionable at the time had a large part in preventing discoveries. There was the industry, money, equipment, enterprise, and highly favorable territory—all that was missing were some new ideas.

### Conclusion

Each of the big waves of discovery can be credited to the influence of a new idea. Once a new discovery is made, the excitement results in a large amount of drilling based on the idea that led to the first discovery, so that the new idea is soon exhausted. This pattern was set early. Within 10 years after the Drake well, almost every oil pool of any consequence in the area was discovered. Within 10 years from the time the anticlinal theory was generally accepted, most of the big anticlines of the U. S. were drilled.

When this happened in the 1920's, the geologists began to fear that we were running out of oil, when the

Cathodic protection supplies in new Cleveland warehouse.

**ANNOUNCEMENT! CSI OPENS CLEVELAND, OHIO PLANT**

Here's another reason why you'll find it pays to check with CSI for help in preventing corrosion on buried metal structures of all kinds. Now, to serve you faster and better, CSI has opened a new office and warehouse at 1309 Washington Ave., Cleveland 13, Ohio.

CSI engineers are pioneers and experts in the cathodic protection of transmission and distribution pipelines, oil and gas well casing, tank bottoms, etc. They offer a complete line of:

- **Brand-name materials and equipment, including**
  - Good-All rectifiers to meet your requirements
  - Dow magnesium anodes, including the new Galvomag
  - Packaged & special anodes to your specifications
  - National graphite anodes, Duriron anodes
  - Instruments by Agra, Fisher, Collins, etc.
  - General cable, Cadweld equipment, many others
- **Expert engineering and consulting services**
  - Design and installation—experienced crews
  - Equipment to handle the largest turnkey job.

Large stocks for immediate shipment. Competitive quotations or estimates without obligation. Let us demonstrate our economical and satisfactory service. Call or write today.

CSI

**CORROSION SERVICES INCORPORATED**

**Cleveland 13, Ohio**
**1309 Washington Ave.**
**Tel. CHerry 1-7795**

**General Office: Tulsa, Okla.**
**Box 7343, Dept. J-18**
**Tel. Circle 5-1351**

trouble really was that they were out of ideas. Within 10 years these same geologists were drowning in a flood of new oil from stratigraphic traps.

The primary value of geologists to the industry lies in their familiarity with how oil has been found in the past. Based on this experience, they try to find oil now. But history shows clearly and repeatedly that past experience is exhausted quickly; frequently in 10 years or less, which is before a new method can be generally accepted and incorporated into textbooks.

Sometimes while geologists were probing around with old method, finding smaller and smaller pools, wildcatters and doodlebuggers went out and started a new burst of discovery. It often happened that the geological interpretation which led to the wildcat location was wrong, but the oil was there anyway. Instead of claiming a false credit, geologists should learn their lesson and revise not just their maps, but also their thinking.

In making forecasts the only certainty is that the oil of the future will not be discovered where it has been found in the past by methods that have been successful in the past.

NOTE: This is an abridged version of the author's presidential address to the Tulsa Geological Society. The complete text will appear in the society's annual digest.

### References

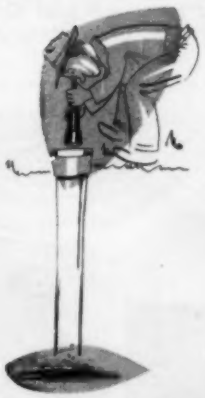

1. Derrick's Handbook of Petroleum, Oil City, Pa., 1898.
2. Sherrill, R. E., Dickey, P. A., and Matteson, L. S., "Types of Stratigraphic Oil Pools in Venango Sands of Northwestern Pennsylvania," Stratigraphic Type Oil Field, AAPG, 1941, pp. 507-538.
3. Carll, John F., Report of Progress in the Venango County District, second Geol. Surv. of Pennsylvania, Harrisburg, 1874.
4. Hunt, T. Sterry, "Notes on the History of Petroleum or Rock Oil," Canadian Naturalist, 1861, Vol. 6, pp. 241-55.
5. Andrews, E. B., "Rock Oil, Its Geological Relations and Distribution," American Journal of Science, July 1861, second series, Vol. 32, No. 94.
6. White, I. C., "The Geology of Natural Gas," 1885, Science, Vol. 5.
7. Orton, Edward, "First Annual Report, Geol. Surv. of Ohio (Third Organization)," 1890, pp. 92, 107.
8. Carll, John F., "Second Geological Survey of Pennsylvania," Harrisburg, 1885, Vol. 3.
9. Beal, C. H., "Geologic Structure in the Cushing Oil and Gas Field, Oklahoma," USGS Bull., 1917, No. 658.
10. Heald, K. C., et al., "Structure of Oil and Gas Resources of the Osage Reservation, Oklahoma," USGS Bull., 1922, No. 686.
11. Ver Wiebe, Walter A., "Oil Fields in the U. S., McGraw-Hill, New York, 1930, p. 133.
12. White, David A., "Some Relations in Origin Between Coal and Petroleum," Jour. Wash. Acad. Sci., 1915, Vol. 5, pp. 189-212.


## Ohio extension confirmed

A MILE-EAST extension to the Cottage Hill pool in Hopewell Township, Muskingum County, was confirmed by Mutual Oil & Gas Co.'s 1 Glenn Shepler, Section 3.

Clinton sand was reported at 3,291-3,342 ft. and flowed 200 bbl. in 8 hours after fracture.

## NEXT WEEK



**What's the best way to set up a drilling program?**


**SPECIFY TRI-DIA TODAY!**

***for fastest diamond drilling***

**Plan your D & S Bit Program to Fit these Conditions**

Each bit is custom designed according to (1) volume circulated, (2) type mud, and (3) formations. Our sales engineers will be happy to recommend the bit to give maximum penetration rates on your well.

TRUCO DIAMOND BITS

Drilling & Service INC.

DIAMOND DRILLING EQUIPMENT

6210 NORTH CENTRAL EXPRESSWAY • DALLAS, TEXAS

OFFICES IN ALL PRINCIPAL OIL AREAS

*Ultra Fine Diamond Equipment for the Oilfield*

"Where's Fred?"

## Geophysics prospects get SEG awards

THE THIRD ANNUAL AWARD of university scholarships in geophysics has been made by the Scholarship Fund of the Society of Exploration Geophysicists.

There will be 25 scholarships granted by individual companies interested in the geophysical profession and two scholarships financed by the organization's general fund. The 1958-59 educational grants will total $21,000 and will be taken in 17 universities.

# California hot spot gets another chance

## . . . in San Joaquin County

PORTER SESNON et al were moving a rig back on 33-22 Sesnon-Giambastiani, its gas test which caught fire recently in the Vernalis gas field of San Joaquin County. The well caught fire while a test was being run. Befort it could be controlled, the rig was totally destroyed. It was finally snuffed out by dynamite after burning out of control nearly 36 hours. Before it caught fire, it tested at a rate of 5 M.M.c.f.d.

Sesnon plans to drill the test deeper. Its present depth is 3,562 ft. It is located nearly 1 mile west of Sesnon's new Vernalis pool discovery scored several months ago.

**California highlights . . .** Standard Oil Co. of California has staked its first offshore test of the 5,500-acre lease it holds 50-50 with Humble Oil & Refining Co. off Summerland in Santa Barbara County. The first well, to be drilled from a platform located ¾-mile offshore, will be 1 Standard-Humble-Gaviota State . . . About 10 miles south of the Standard platform at Summerland, Richfield Oil Corp. was nearly ready to start drilling its first test from its artificial island on a 1,170-acre offshore lease at Rincon.

## . . . while in Kern County

THE first extension test, Richfield Oil Corp. 81-8 KCL H, to the closely watched San Emideo Nose discovery in Kern County, California, was nearing completion with 5½-in. liner including 57 ft. of perforations landed at 11,548 ft. No figures have been released on any preliminary testing.

The discovery well located about ½-mile southeast of this extension was completed in 108 ft. of zone between 11,452-11,560 ft.

Northeast of the discovery, Richfield was drilling below 4,864 ft. on the second extension in the field.

## . . . and in Ventura County

One of the state's most active drilling areas at present continues to be the old South Mountain field in Ventura County, California.

At last count, there were eight rigs drilling development and stepout wells in the several pools involved in the field.

The honors are equally divided between the southwest flank of the original South Mountain field production area and the 1955 Bridge pool discovery area on the northwest edge with four rigs active in each.

The four Bridge pool drilling projects are all located on the extreme southwest flank of the play in Sections 15 and 22 of 3n-21w. These wells are part of a unique situation peculiar to this part of California where Pliocene production is found at depths considerably below the older Miocene and Eocene formations which overly the Pliocene along the Oakridge fault.

the HEART is where the home is

A Turn-Key Job

Finest Workmanship

Complete Satisfaction

Site Planning

Purchase or "Lease-Rental"

Write for Catalog of Whitmor distinctive field homes.

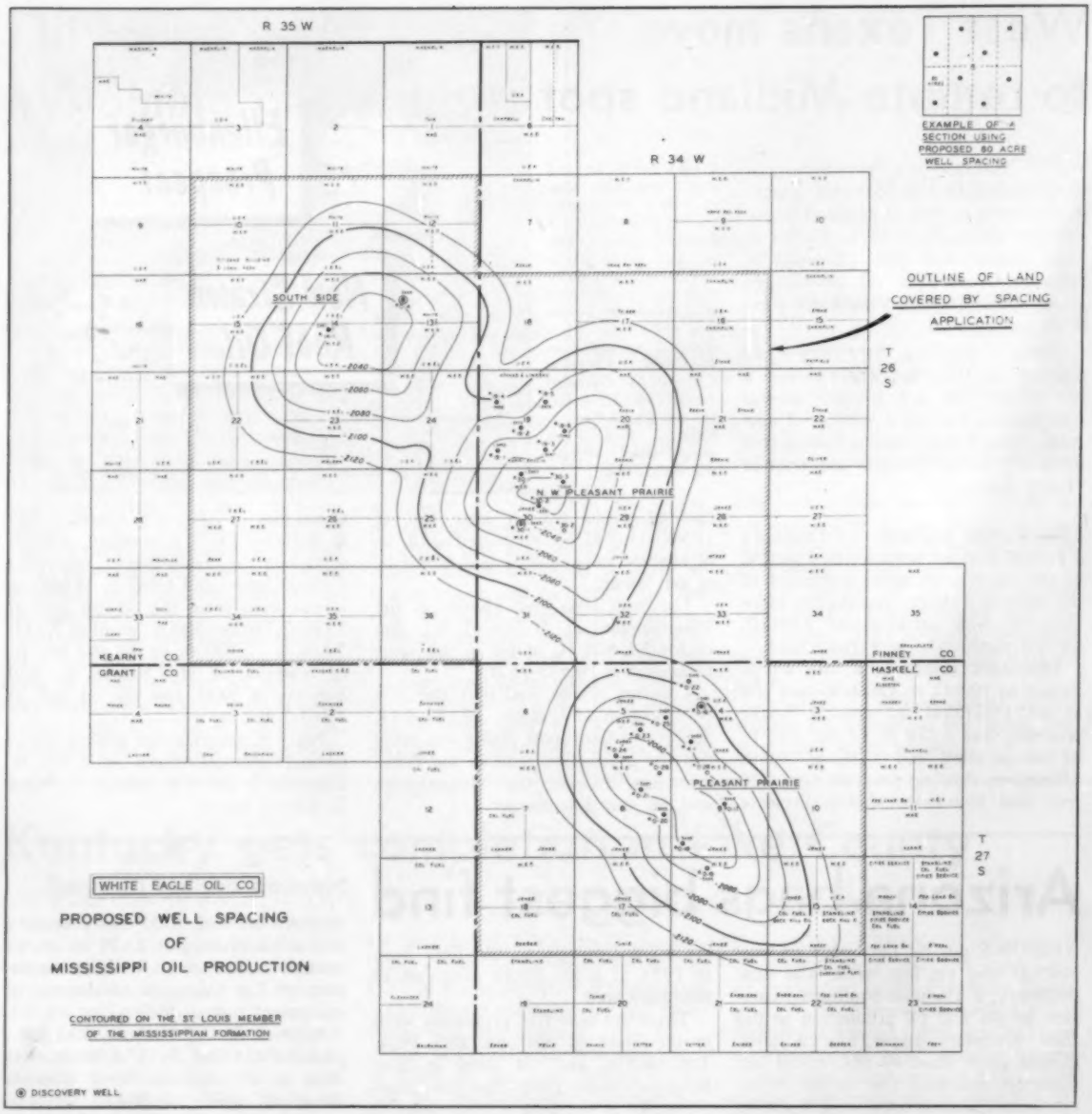
WHITMOR FIELD HOUSING provides real homes for your employees. Designed for your individual needs. Wholehearted employees are your most valuable asset — and they prefer the truly liveable Whitmor Home.

Complete site planning, including all utilities; wide variety in design; 2 and 3 bedroom; on-site construction by experienced Field Crews; Nationally advertised materials; — all marks of Whitmor's "Uniform Quality".

Companies from coast to coast take advantage of Whitmor's 36 years experience to obtain the finest field homes.

WHITMOR HOMEBUILDERS INC.

INDUSTRIAL HOUSING | BOX 5037 • TULSA, OKLA.




**HERE** is Helmerich & Payne's interpretation of the pre-Permian area of southwestern Kansas. Three Hugoton area fields are shown on the map—Pleasant Prairie, South Side, and Northwest Pleasant Prairie. (See Exploration Highlights, p. 283).

The main producing formation of the South Mountain field is Sespe of Miocene age and was discovered originally back in April of 1916.

Average depths of the Sespe pool wells is 4,552 ft. while the Bridge pool Pliocene wells average 8,367 ft. in depth.

The north and east limits of the Bridge pool appear to be pretty well defined by drilling to date with recent drilling operations confined to southwest offsets and extensions. Since its discovery in December 1955, the southwest limits of the Bridge pool have gradually neared Shell Oil Co.'s prolific Saticoy field and the two are now only a little more than 1 mile apart.

According to the latest records, there are now 43 wells making an average of about 200 bbl. daily each in the Bridge pool and 412 wells making around 38 bbl. daily each in the main producing areas of South Mountain field.

## Offset well probes Michigan discovery

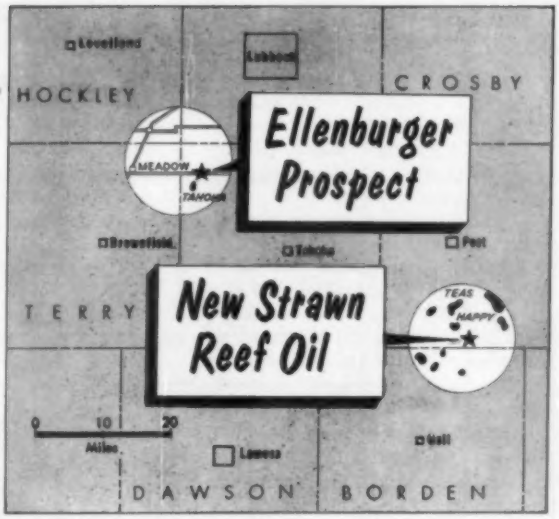
SUN Oil Co. cored oil-saturated Niagaran reef section on 1 Desgrandchamp, NW SW NE 22-4n-15e, St. Clair County, and cemented 5-in. casing at total depth of 2,680 ft. Test is a northeast 40-acre unit offset to Mills and Basin's 2 Waltos, currently flowing 98 bbl. oil per day pinched from the Niagaran reef.

Sun cored reef pay at 2,627-53 ft. and had limited oil saturation from 2,562 ft.

Michigan operators are closely watching Sun's offset, first new development since the 2 Waltos was completed for 600 bbl. per day in the reef section at 2,652 ft.

Lease activity in southeastern Michigan has increased markedly the past month reflecting the St. Clair play.

# West Texans move to remote Midland spot




**CIRCLED** on the map are two discovery prospects. Felmont Oil Corp. 1 Powell, Lynn County, had good Ellenburger shows. Only nearby production is Strawn at Tahoka field. The Strawn prospect in southern Garza County is General American Oil & Refining Co. 1 Koonsman, 2 miles from established Strawn oil production.

WEST TEXAS discovery news last week shifted to a little-drilled county in the northern end of Midland basin. Felmont Oil Corp. 1 E. L. Powell in Lynn County had good prospects of opening Ellenburger oil production. Initial drill-stem tests indicated a good thick pay section.

Garza County, bordering Lynn County on the east, has enjoyed a hot drilling play over the past several months, and has had a number of new pools opened. Last week a Strawn reef discovery was in prospect southeast of Happy field.

**Lynn County explorer . . .** Felmont's 1 Powell is in the northwestern section of the county, 18 miles northwest of the town of Tahoka, and slightly more than ½ mile northeast of 9,800-ft. Strawn production in Tahoka field.

Operators drilled into the Ellenburger at 10,922 ft. On drill-stem test at 10,915-11,000 ft., open 2 hours, recovery was 2,219 ft. of oil, 180 ft. of oil-cut mud and 5 ft. of water. Maximum flowing pressure was 820 psi., and 30-minute shut-in pressure reached 3,140 psi. A later test at 10,990-11,050 ft. recovered 370 ft. of slightly gas-cut mud and 8,500 ft. of salt water.

The well also had shows in the Mississippian at 10,514-42 ft., and recovered 620 ft. of oil in the same formation at 10,515-95 ft.

Location of the well is in the NW NW Section 139, Block 12, EL&RR Survey. At last report casing was being run for production tests in the Pennsylvanian Strawn, the Mississippian and in the Ellenburger.

**Garza test . . .** General American Oil & Refining Co. 1 Koonsman, 9 miles southwest of Justiceburg, recovered 1,550 ft. of oil and 1,145 ft. of heavily oil-cut mud from the Strawn reef at 7,680-7,730 ft.; 500 ft. of oil at 7,734-7,806 ft.; 2,200 ft. of oil and 862 ft. of mud-cut oil at 7,818-68 ft., and 806 ft. of mud and oil on test at 7,867-7,967 ft.

No. 1 Koonsman was drilling ahead toward contract depth at 8,500 ft. Location is SW SW Section 5, Block 2, T&NO Survey.

# Arizona bags biggest find

ARIZONA put on the books its biggest oil find yet last week. The new discovery, a 1¼-mile southeast extension to gas and oil production in the East Boundary Butte field area, flowed more than 40 bbl. of oil per hour on drill-stem test of the Pennsylvanian. Several tests were made in the Hermosa.

Location is south of the 1955 oil find at 1 Navajo in W½ NE SE 4-41n-28e. That well made only 47 bbl. of oil per day and 4,141 M.c.f. of gas. It was a Paradox-Pennsylvanian gas well and a Mississippian oil well. Shell Oil Co. opened the field itself in 1954 at a gas strike northeast of Humble's well.

There are now five producing wells in the State of Arizona. Bita Peak, Toh-Ah-Tin, and the three in East Boundary Butte field. The new Humble strike is the best wildcat news in Arizona yet. It lies just south of the Four Corners Pipeline and also the vast oil reserves in Aneth to the north in San Juan County, Utah. A good completion at this well will most certainly put the heat on lagging Arizona interest.

# Bit probes below 11,000 ft. on Alaskan Peninsula

HUMBLE OIL & REFINING CO. was drilling below 11,176 ft. on 1 Bear Creek Unit in the Widebay-Kanatak area on Alaskan Peninsula.

Colorado Oil & Gas Corp. was drilling below 7,156 ft. on 3 Yakutat in the Cape Fairweather region.

Standard Oil Co. of California was drilling below 4,841 ft. on 3 Swanson River Unit on the Kenai Peninsula.

In the Susitna Flats region, Anchorage Gas & Oil Development Co., Inc.'s two tests were standing idle at 4,049 ft. and 6,054 ft. respectively.

## Nevada drilling resumed

BONANZA OIL CO. was preparing to resume drilling at 2,675 ft. on its wildcat located about 10 miles southwest of Las Vegas. A breakdown in equipment halted drilling.

Colmarraw Oil Products Co., Inc., planned to spud in a 6,000-ft. test soon on a 5,000-acre lease it holds about 12 miles southwest of Las Vegas.

# Texas' Lipscomb adds oil to gas finds

TONKAWA oil production was added to gas production in Kellin Tonkawa gas field, Lipscomb County in the Texas Panhandle.

El Paso Natural Gas Co. completed the 1-B Kellin in this Pennsylvanian zone through perforations at 7,298-7,314 ft. The well flowed 600 bbl. of oil per day through various chokes. Location is 9 miles northwest of Canadian in the northeastern corner of the Panhandle. Spot location is Section 111, Block 43, H&TC Survey.

# Oil found midst Wyoming gas area

**INDICATED** oil discovery in Sweetwater County, southwestern Wyoming. Middle Mountain field (near Colorado line on map) is nearest oil production.

DISCOVERY of a new oil field in southwestern Wyoming's Green River basin is indicated by showings encountered in a wildcat Caulkins Oil Co. is drilling 20 miles southeast of Rock Springs, in southern Sweetwater County.

In an area where gas has been the major production, the indicated oil discovery is 18 miles from the nearest other oil production, located in Middle Mountain field, near the Colorado line. It is 6 miles southeast of South Baxter Basin field and about the same distance northwest of Potter Mountain field, nearest other fields, both gas productive.

Oil showings in Caulkins' wildcat, 4-8A Federal, have been in Dakota sand, in which a series of drill-stem tests were made below 3,600 ft. Best recovery was in a test at 4,100-60 ft. This was 30 ft. of gas-cut mud, 450 ft. of gas-cut oil (50 to 95% oil), 180 ft. of water-cut mud, 90 ft. of water-cut oil (60% oil), and 90 ft. of mud-cut water. Tester was open 2 hours for this recovery, and had gas at the surface within 45 minutes with flowing pressure ranging from 125 to 390 psi. Shut-in pressure was 1,180 psi.

A previous 90-minute test at 4,067-4,111 ft. recovered 360 ft. of oil and gas-cut mud, and 90 ft. of lightly mud-cut and heavily gas-cut oil (60% oil). An earlier test at 3,610-58 ft. recovered 210 ft. of heavily gas-cut mud after flowing gas at the rate of 214,000 cu. ft. per day.

Gas production at South Baxter Basin field is from Frontier and Dakota sands. That at Potter Mountain field is from Frontier and Dakota sands.

Caulkins is drilling ahead in his wildcat for a look at the potentially productive lower horizons.

# Kentucky gets completion in Pike County

ON WOLFPEN BRANCH of Left Fork of Long Fork in Pike County, Kentucky, West Virginia Gas Co. has completed 1093 George F. Johnson et al., as a Mississippian Big Lime natural gas well.

Big Lime topped at 2,507 ft., topped gas zone at 2,724 ft. and produced at the rate of 709 M.c.f.d. with a rock pressure of 518 lb. Total depth of hole was 2,775 ft.

## . . . and in Breathitt County

IN BREATHITT COUNTY and located at Herald Cemetery on Middle Fork of Kentucky River, Prewitt et al. 1 Tim Herald wildcat is dry and abandoned at a total depth of 1,990 ft.

Top of Corniferous lime was found at 1,895 ft., but was void of shows. Test was about 4½ miles south of production.

ON JETTS CREEK in western Breathitt County and 3½ miles west of production in the Puncheon Camp pool, W. W. Prewitt has drilled a dry hole at his wildcat 1 Bell Spicer. From an elevation of 898, operator topped Corniferous limestone at 1,634 ft. and drilled to a total depth of 1,734 ft. No shows of oil or gas were reported.

# Colorado discovery well completed

INITIAL completion tests of the recent wildcat dual-zone gas discovery in La Plata County, Colorado, have been announced by Harry A. Trueblood, Jr., president of Consolidated Oil & Gas, Inc., of Denver, Colo., operator of the well.

The significant new gas discovery which is known as 1-6 Superior Ute was drilled by Consolidated as operator in association with Occidental Petroleum Corp. of Los Angeles and Black Bear Consolidated Mining Corp. of San Antonio on an 8,000-acre block belonging to these companies. Using San Juan basin standard testing procedures for initial potentials, gas flowed through a ¾-in. choke at the rate of 1,585 M.c.f.d. from 76 ft. of perforations in the Fruitland formation and 1,750 M.c.f.d. from 219 ft. of perforations in the Mesaverde formation. This initial potential test also indicated open-flow capacities from the Fruitland of more than 3 M.M.c.f.d. and from the Mesaverde of more than 4 M.M.c.f.d.

The operator stated that pending release of this official completion information a name had not been designated for the new field discovered by successful completion of this wildcat well, some 7 miles south of the town of Bayfield.

Trueblood announced that a large-scale development program of the 8,000-acre block is planned for 1959.

## *Successful Wildcats*

**KANSAS**

Cowley County: H. H. Blair 2 Kingan, SW SW SW 2-30s-6e. IP 10 BOPD, 10 BWPD, 1,816-20 ft. TD 3,316 ft. New pay in Atlanta pool.

2 Lehman, NE NE NE 10-30s-6e. IP 25 BOPD, 200 BWPD, Arbuckle 3,273-89 ft. TD 3,289 ft. New pay in Atlanta pool.

1 Blair Ranch, SW SW NW 11-30s-6e.

IP 21 BOPD, 25 BWPD, Miss. 2,869-97 ft. TD 2,897 ft. New pay in Atlanta pool.

Ellis County: Petroleum, Inc., 1 Werth, NW¼ 2-13s-20w. IP 145 BOPD, 33°, 3,833-39 ft. TD 3,839 ft. Opens Werth pool.

Rooks County: Davis Bros. 1 Shephard "G," SW SE NW 25-10s-18w. IP 15 BOPD, 40 BWPD, 35°, Lansing 3,413+ to 3,428 ft. TD 3,675 ft. Opens Windy Ridge pool.

Stafford County: Chief Drilling Co. and Sunray 1 Waters, SW NW SW 33-24s-14w. IP 51 BOPD, 36.6°, 4,153-57 ft. TD 4,315 ft. Opens Waters pool.

Petroleum, Inc., 1 Harrison "B," NE SW SW 17-24s-13w. IP 76 BOPD, 18% b.s. and w., 35.3°, Lansing 3,658-3,666 ft. TD 4,210 ft. Opens Hatt pool.

Gilead Oil & Gas Co. 1 Wilson, SE SE SW 11-25s-15w. IP 3,589 M.c.f. of gas per day, Miss 4,184 to 4,229 ft. TD 4,280 ft. Opens old Grunder pool.

Aurora Gasoline Co. 1 Giles, SW SW NW 31-25s-15w. IP 312 BOPD, 35.2°, conglomerate 4,329-36 ft. TD 4,411 ft. Opens Southeast Wil pool.

### ALBERTA

York et al 5-33-36-28 Penhold, LSD 5, 33-36-28w4. Basal Quartz oil well. TD 7,014 ft.

Shell 1 Panther River LSD 5, 19-30-10w5. Mississippian gas discovery. TD 13,414 ft.

Choqua Couger-British American 5-14-43-22 Red Deer Lake, LSD 5, 14-43-22w4. Basal Quartz gas discovery. TD 6,040 ft.

### ARKANSAS

Lafayette County: Don D. Montgomery et al 1 Featherstone "A," NWc SW 27-16s-24w. IP 140 BOPD, 32°, Hosston 5,379-86 ft. TD 5,408 ft. New pay in Kress City field.

Namlyn Oil Co. and Lion Oil Co. 1 C. L. Cabe "A," C NE SW 1-18s-24w. IP 57 BOPD, 55.7°, Smackover 9,334-49 ft., 9,361-65 ft. TD 9,379 ft. Opens South McKamie field.

Miller County: Key Producing Co. et al 1 Acruman, C SE NW SE 30-16s-25w. IP Cotton Valley sand 4,690-93 ft. TD 4,905 ft., 2,500 M.c.f. of gas per day. Discovery of new pay, the Hill sand in Cypress Lake field. Also, deep test discovery in Cypress Lake field.

### NORTH ARKANSAS

Logan County: Gulf Oil Corp. 1 A.R.E.C.I., NW¼ 32-9n-23w. IP 7,337 M.c.f. of gas per day, Self sand 3,491-3,530 ft., Bynum sand 4,268-4,306 ft., Dunn sand 5,574-79 ft. TD 6,555 ft. Pitkin discovery.

### CALIFORNIA

Kern County: Reserve Oil & Gas Co. 382-19 BW-T, NE NE 19-11n-19w, IPF 417 BOPD, 33.7° gravity, 18/64-in. choke, perf. at intervals between 11,-368-12,525 ft., TD 12,705 ft. (Deeper Vedder sand discovery in North Tejon field).

Sacramento County: Brazos Oil & Gas Co., Oper. 1 Walnut Grove Unit-A, NE 35-5n-4e, completed as gas well, no estimate, TD 9,505 ft. (About 1 mile south extension to Thornton gas field).

Santa Barbara County: Standard Oil Co. of California 1 Roy Eaton et al, SE SE 11-4n-29w, gas well, no estimate, perfs. 3,400-50 ft., TD 3,596 ft. (New gas field discovery, Glen Annie, 2 miles northeast of Elwood oil field).

Neaves Petroleum Development Co. 1 Neaves-de Hoff, SW NW 10-6s-5w, 12 BOPD, 33° gravity, perfs. 2,020 ft., 2,530 ft., 3,737 ft. TD. (Wildcat discovery 1 mile north of abandoned old Half Moon Bay production).

### ILLINOIS

Edwards County: Murvin Oil Co. 2 L. Smith, 30-1s-11e. IP 20 BOPD, 20 BWPD, 3,092-95 ft. McClosky 3,107-3,111 ft. TD 3,227 ft., SE SE NW. Extension to Albion field.

Jasper County: John M. Zanetis 1 M. E. Kessler, 14-6n-10e. IP 8 BOPD, 16 BWPD, O'Hara 2,721-25 ft. TD 2,899 ft. Extension to Clay City Consolidated field.

Wabash County: Development Association 1 Smith, SE SE SW 32-1n-13w. IP 65 BOPD, Tar Springs sand 2,026-37 ft. TD 2,037 ft. Extension to New Harmony Consolidated field.

Washington County: Centralia Drilling Co. 1 Kroll, SW SE NW 34-3s-2w. IP 24 BOPD, 50 BWPD, Benoist 1,239-48 ft. TD 1,273 ft. Extension to Posen South field.

Wayne County: Alva C. Davis 1 Crows Community, NE SW SE 5-2s-9e. IP 130 BOPD, Aux Vases lime 3,240-54 ft. TD 3,410 ft. New pay discovery

### INDIANA

Gibson County: A. Fritz 1 R. Meyer, SW NE SE 2-3s-10w. IP 60 BOPD, O'Hara 1,966-73 ft. TD 1,975 ft.

1 M. Obert, NE NW SE 13-3s-10w. IP 289 BOPD, Jackson 1,638 to 1,683 ft. TD 1,710 ft. New pay discovery.

Skiles Oil Corp. 1 Carl Parker, SW NE 10-3s-9w. IP 18 BOPD, 15 BWPD, Aux Vases lime 1,872 to 1,888 ft. TD 1,994 ft. Extension to Wheatonville field.

### NORTH LOUISIANA

Concordia Parish: Marlin Exploration, Inc., and Petroleum, Inc., 1 B. J. Schiels Unit, C SE SW SW 32-8n-8e. IP 144 BOPD, 38.5°, Wilcox sand 4,950-52 ft. TD 5,725 ft. Opens Frogmore field.

### MONTANA

Glacier County: Carter Oil Co. 1 McAlpine, C NW NW 12-37n-5w. IP 74 BOPD, Cut Bank 2,625-41 ft., 2,659-70 ft., 29.6°. TD 2,935 ft.

Musselshell County: Amerada Petroleum Corp. and Texota Oil Co. 1 Goffena, 25-9n-27e. IP 180 BOPD, 34.7°, Amsden 6,400-54 ft. TD 6,620 ft.

### NORTH DAKOTA

Bottineau County: Hunt Oil Co. 1 Nermye, C NW NE 31-162n-79w. IP 35 BOPD, 1.4 BWPD, 39°, Spearfish-Charles 3,382-90 ft. TD 3,493 ft. Discovery in South Westhope area.

Great American Exploration Co., Inc., 1 H & H. Nordmark, C NE NE 31-163n-78w. IP 90 BOPD, Mission Canyon 3,118 to 3,170 ft. TD 3,215 ft., 38°. Discovery in Roth area.

### SASKATCHEWAN

Skelly-Justin 4-21- Kyle, LSD 4, 21-5-32w1. Mission Canyon oil well. TD 3,871 ft.

### WYOMING

Fremont County: Petroleum, Inc., 1 Tribal, 15-5n-1w. IP 5,010 M.c.f. of gas per day, Crow Mountain 1,306-09 ft. 1,337-41 ft., 1,384,90 ft., 1,500-02 ft. TD 1,605 ft. New gas discovery in Little Dome field.


*This is not an offering of these Debentures for sale, or an offer to buy, or a solicitation of an offer to buy any of such Debentures. The offering is made only by the prospectus.*

**$150,000,000**

## Standard Oil Company of California

**4⅜% Sinking Fund Debentures**

**Due July 1, 1983**

**Price 99.625%**

**Plus accrued interest from July 1, 1958**

*Copies of the prospectus may be obtained from any of the several underwriters only in states in which such underwriters are qualified to act as dealers in securities and in which the prospectus may legally be distributed.*

Blyth & Co., Inc. — Dean Witter & Co.

The First Boston Corporation — Kuhn, Loeb & Co. — Merrill Lynch, Pierce, Fenner & Smith

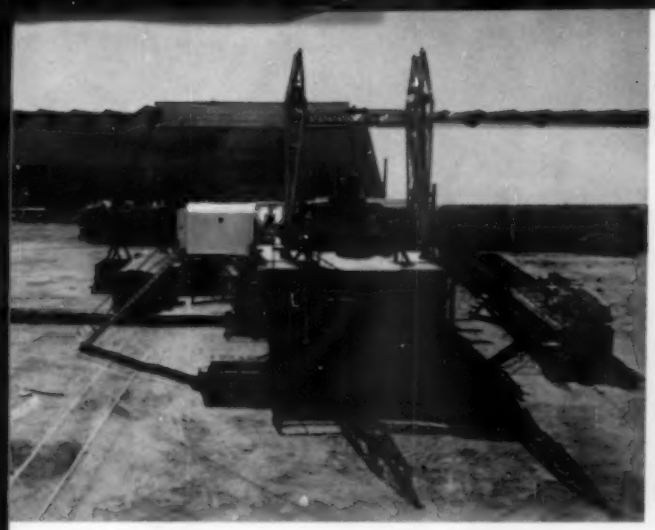
Eastman Dillon, Union Securities & Co. — Glore, Forgan & Co. — Goldman, Sachs & Co.

Harriman Ripley & Co. — Kidder, Peabody & Co. — Lazard Frères & Co.

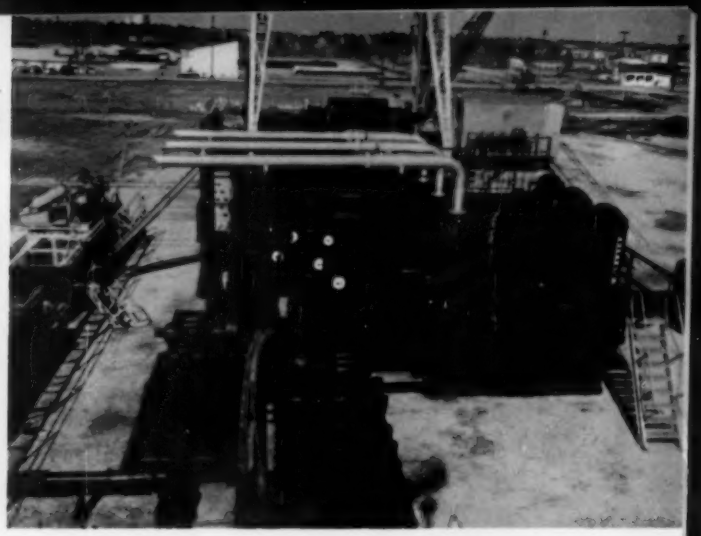
Lehman Brothers (Incorporated) — Smith, Barney & Co. — F. S. Smithers & Co.

Stone & Webster Securities Corporation — White, Weld & Co.

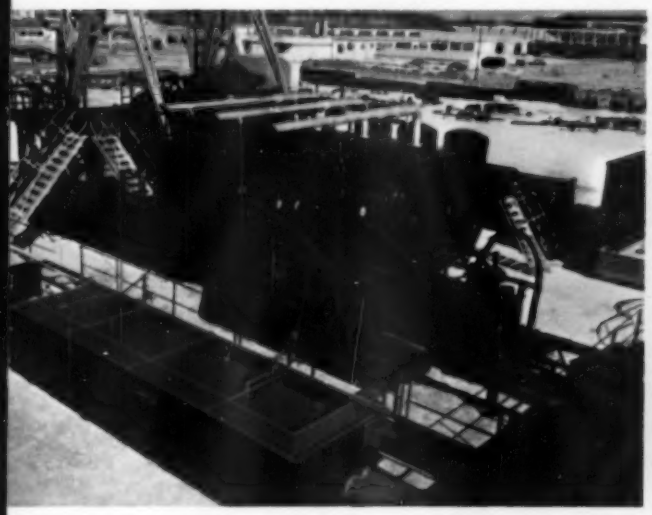
September 5, 1958.



A National 110 rig-up gets underway at our Houston Plant yard. This rig is presently drilling in Africa.



The draw works is now complemented with engines, drive group and slush pumps. This machinery is positioned exactly as it will be used at the well site.



The slush pump manifolding is completed—a "ready to drill" circulatory system from mud tanks to rig floor.

Here's the complete assembly of all machinery and auxiliary equipment, operative and arranged for maximum efficiency.

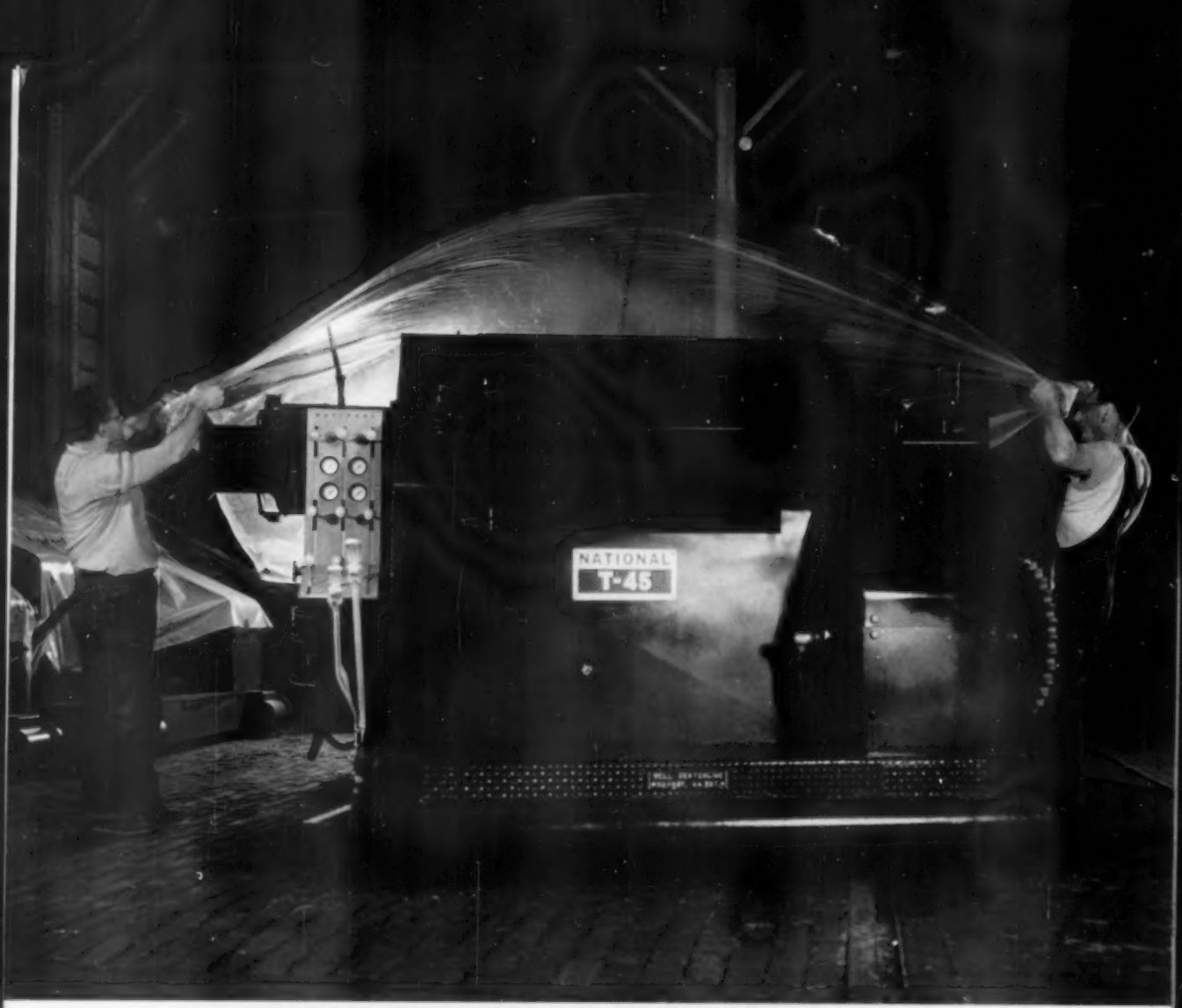
## National's rig-up service saves you time and money anywhere in the world!

There's a *sure way* to be *fully* prepared for a new drilling job anywhere in the world—and National Supply's optional rig-up service provides it.

In either of our two special port center rig-up yards or your own equipment yard, we assemble—or direct the assembly of—the complete rig. Everything is positioned exactly as it will be used overseas. Then we test-operate, lubricate and adjust all components. Any problems that may cause initial delays at the well site are promptly solved. If you desire guide photographs similar to those above and paint-coded parts for re-assembly, these are also supplied.

You can see how this rig-up service pays off for operations in remote areas, where services and parts are often days away. But it is also important for rigs closer to home—where even a short delay boosts estimated operating costs.

National has performed this time-and-money saving rig-up service for many years. We have a big list of satisfied customers who report *better rig-up time this way than with previous field assemblies*, and we will be glad to give you more details. Just contact the National representative in your area or our Export Division office in New York City.




An assembled T-45 gets a protective plastic cover at National's Toledo, Ohio, plant. While this is a conventional skid-mounted rig, its compact, streamlined design makes it thoroughly suitable for trailer mounting.

# You can trailer-mount this new 550-horsepower National Rig!

## The T-45 is designed for medium-deep drilling and the most in mobility!

A 550 input horsepower rig with a normal drilling range from 4500 to 7500 feet—that's National's compact new T-45. Proving once again National's rig design leadership, the T-45 offers you the ultimate in mobility, simplicity and dependability. It's packed with features which not only insure long service life, but also fast, precise operation.

**ONE-PIECE MAIN FRAME**

The sturdy main frame is of one-piece construction, including an extension skid base for mounting the drive group. You can remove the catheads, air control housing and drive group in a short time—and you have a rig less than 8′ wide, suitable for fast well-to-well moves over any highway.

### STREAMLINED PANEL CONTROL

The T-45's streamlined panel control arrangement gives you the maximum in convenience for operating speed and drilling ease. Control valves and all other pneumatic equipment are the highest quality obtainable. Special safety devices are provided in the air system which insures proper regulation and control throughout the draw works. Pressure gages to the major air clutches give a continuous record of draw works performance. Moreover, a generous air supply to the large volume pressure tank in the draw works frame insures peak performance at all times.

### BIG MAIN DRUM AND CLUTCHES

You'll get the best spooling performance and wire line life with the T-45's large diameter drum barrel. Either 1″ or 1⅛″ double crossover counterbalanced wire line grooving is available. There's no need to remove guards or cover plates to anchor the wire line.

The outboard mounted 24″ main drum shaft clutch is designed with special emphasis on ample air cooling passageways and long diaphragm life. Lock-up screws are provided for emergency operation.

### EFFICIENT DRUM BRAKES

The effective brake band area for the 42″ main drum brake is 1600 square inches, and the brake actuating mechanism is of the well-known National Type "K" principle. This system of braking action permits precise feed-off, eliminates brake handle kick-back.

### 2-SPEED AIR CLUTCH TRANSMISSION

This transmission insures almost instantaneous speed selection. The torque converter drive acts as a cushion and virtually eliminates clutch slippage and heating.

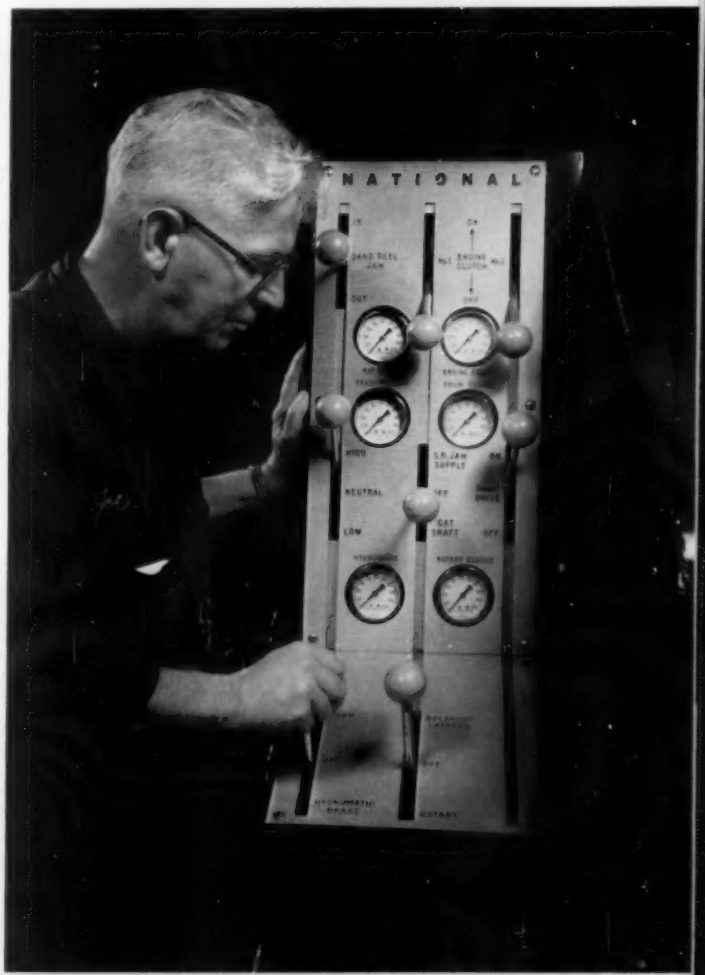
### UNLIMITED POWER ARRANGEMENTS

Depending on your space and weight limitations, you can have many variations in engine combinations for the T-45. Its input horsepower rating is 550, and it is basically designed to be driven by one or two engines. Engines can be arranged to offer the following combinations: (1) Two engines which can be mounted on the draw works extension beams and handled as a unit; (2) A two-engine (larger engines) sectional type compound without pump drive; (3) A two-engine sectional compound with provisions for a pump drive, including a supplementary transmission for the draw works; (4) A single engine arrangement without pump drive; (5) Electric motor drive.

### MANY OTHER FEATURES

Some other outstanding features of this streamlined new rig include: a "front porch" mounted rotary countershaft; a heavy-duty reverse gear that is standard on all units, and an air-operated catshaft. A sand reel is available as optional equipment.

With all these sound construction features, plus its adaptability for trailer mounting, the new T-45 is a natural for clinching contracts on medium-deep drilling jobs. You can get complete information today from the National representative in your area.




The streamlined control panel on the new T-45 has easy-reach control levers for maximum drilling ease and speed. Special safety devices are provided in the air system which insures proper regulation and control throughout the draw works.

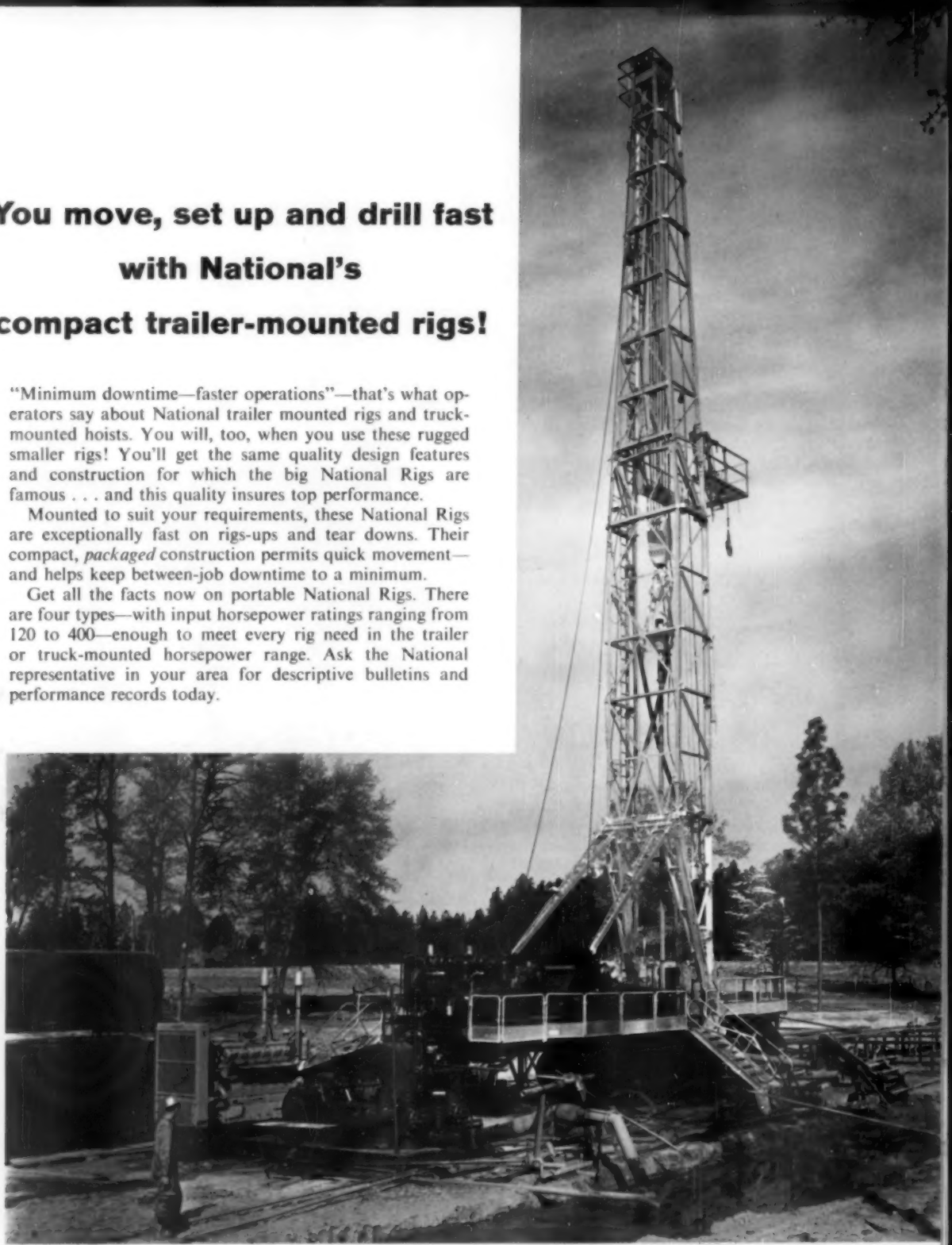
***See the next page for the best trailer-mounted rig line available today!***

# You move, set up and drill fast with National's compact trailer-mounted rigs!

"Minimum downtime—faster operations"—that's what operators say about National trailer mounted rigs and truck-mounted hoists. You will, too, when you use these rugged smaller rigs! You'll get the same quality design features and construction for which the big National Rigs are famous . . . and this quality insures top performance.

Mounted to suit your requirements, these National Rigs are exceptionally fast on rigs-ups and tear downs. Their compact, *packaged* construction permits quick movement—and helps keep between-job downtime to a minimum.

Get all the facts now on portable National Rigs. There are four types—with input horsepower ratings ranging from 120 to 400—enough to meet every rig need in the trailer or truck-mounted horsepower range. Ask the National representative in your area for descriptive bulletins and performance records today.



This complete National T-32 Rig, rated at 400 input horsepower, is shown on location in Mississippi. National Rigs and Hoists utilize torque converter drives for smooth operation and a great variety of running speeds.

THE **NATIONAL SUPPLY** COMPANY
Two Gateway Center, Pittsburgh 22, Pa.
DIVISION OFFICES: Calgary, Dallas, Denver,
Houston, Toledo, Torrance, Tulsa
EXPORT: 600 Fifth Avenue, New York 20, N.Y., U.S.A.;
City Wall House, Chiswell Street, London E.C.1

**AS PRESIDENT** of the largest drilling contracting firm . . .

# Bob Wire's Always on the Go

THE MAN who runs the world's biggest drilling contracting firm is a one-time traveling salesman who still believes that travel is the best way to run a widespread business—even for the president.

Robert William (Bob) Wire once was the top oil-country salesman for National Tube Co. Nearly 11 years ago he was hired by Loffland Brothers Co. at Tulsa to preside over its 103-rig drilling empire.

Today Loffland Brothers still has 103 rigs, twice that of any other contractor, but its capital investment has increased immensely with bigger rigs for expanding foreign operations and deeper drilling.

Bob Wire attracts attention wherever he goes—and not just because his name sounds like a fence material. A strapping man with a deep voice and a confident air, Wire is a fast-moving operator who knows where he's going—and he always seems to be going somewhere.

So far this year he's made three month-long trips to South America, not to mention innumerable sallies into the far corners of the domestic oil country. Not satisfied to hit the district offices alone, he travels to the rig sites and "sees the trade" in the areas where he goes.

"I don't know of any better way of knowing what is going on except to go into the field," he says. "I find out our company's problems that way. I just like to see what's going on."

**From steel to oil . . .** Wire, who turns 59 this week but moves like an eager-beaver of 30, was born in Lorain, Ohio, and attended Miami University at Oxford, Ohio.

He studied no engineering, no geology, nothing about oil. But he got a business-administration degree that set him on the track toward the career he was to follow more than 25 years later.

A born salesman, he became just that. He joined National Tube Co., a U. S. Steel subsidiary, working out of Chicago until 1937. Then he moved to Pittsburgh as assistant general manager of sales.

Wire began specializing in oil company business in 1939 and spent most of 3 years traveling the oil patch selling tubular goods. World War II cut short this work, and he was moved in as manager of sales for a war-born U. S. Steel subsidiary, Tubular Alloy Steel Corp. at Gary, Ind.

The war over, Wire went back to oil as the sales director of National Tube's headquarters in Dallas.

After Loffland Brothers underwent a change of ownership in late 1946, Wire was hired on January 1, 1948, as its president, the job he still holds today.

**Expansion . . .** In the years Wire has guided Loffland Brothers, two developments have sharply affected contract drilling.

First, overseas drilling has become big business for U. S. operators.

And second, most of the integrated oil companies have turned to contractors for drilling, rather than do the work themselves.

In both these developments, Loffland Brothers and Bob Wire have had a major hand.

When Wire became president, Loffland Brothers had two overseas rigs—both in Venezuela. Today the company has 29 in Venezuela, 4 in Colombia, 1 in Bolivia, 1 in Libya, and 6 in Canada. And it is preparing to build its strength in the Eastern Hemisphere with a full-time representative at The Hague to negotiate for jobs in the Middle East and North Africa.

In Venezuela alone the company has $12.5-million worth of new equipment. Loffland Brothers, with Wire keeping close personal tab on the operations, is pioneering the offshore drilling in Venezuela's portion of the Gulf of Paria, one of the world's new oil hot spots.

**The change . . .** To Wire, the big story of the past decade has been the drilling contractor's success in selling the oil producer on the wisdom of hiring his drilling done.

And Wire is proud that his company has been a leader in this movement.

"Thirteen of our rigs were purchased from companies at a time when we assumed the drilling obligations," he recalls. "And we were the first contractor to enter Venezuela as an independent owning his own equipment."

The change in operating methods has been no accident. The reasons are sound.

"With the drilling contractor you have operating experience you don't have in big integrated oil companies, and you don't have the slack and lost time," Wire says. "We do it cheaper by having a cheaper over-all investment. And we can move in on drilling problems faster."

Major oil companies which do their own drilling suffer because of sharp year-to-year changes in the number of wells they drill, he points out, while these changes will tend to balance out over the industry as a whole and thus make contract drilling more economical.

**The recession . . .** All is not peaches and cream, however.

The drilling contractor, just like any other business man, suffers dur-

## ▶ ▶ ▶ Personals

ing slack times—as at present. And Loffland Brothers is no exception.

Just about half of Loffland's 103 rigs are currently operating, while 75 or 80 would be normal.

However, these figures are somewhat misleading because the company has far more than half its total investment operating. The bigger and better rigs are at work abroad and at home.

Surprisingly, Wire is not an optimist about a pickup in drilling. He cautiously wonders aloud whether the number of active rigs in the U. S. might not level off at the present 2,000-2,200 figure, rather than push again to a peak of 3,200-3,300.

He watches closely the drilling budgets of the major companies and is an expert at spotting trends.

But even Wire is ready to admit that budgets "can be changed" and that forecasting is a difficult art at best.

**Other activities . . .** Despite the heavy load he carries as an on-the-go president of Loffland Brothers, Wire finds time for a wide range of other duties and pleasures.

He is a director of the AAODC, the Mid-Continent Oil and Gas Association, and the Rocky Mountain Oil and Gas Association. He also is a member of the board of trustees of the University of Tulsa.

He is a member of the board of governors of Tulsa's Southern Hills Country Club and the Tulsa Club, and he shoots golf in the middle 80's.

He and Mrs. Wire have one married daughter and two grandchildren.

●

**Ernest R. Buck,** geologist with Eldorado Refining Co. in Wichita, has been transferred to American Petrofina Co. of Texas as senior geologist in Wichita Falls, Tex.

**Frank Lindeman, Jr.,** formerly vice president in charge of production and a director of Pan American Petroleum Corp., has joined United Carbon Co. as general manager of the oil and gas division. He will be executive vice president of United Producing Co., Inc., United Carbon's oil and gas subsidiary, and will have charge of exploration, drilling, and production activities. A graduate of Colorado School of Mines, Lindeman was with Pan American 5 years before recently resigning to open consulting offices in Tulsa.

**I. J. Pierce,** division manager of Phillips Petroleum Co.'s land and geological department in Oklahoma City, has joined Reading & Bates Offshore Drilling Co. as manager of the land and exploration department. A graduate of the University of Oklahoma, Pierce joined Phillips in 1938.

**J. C. Ensey,** tool pusher with B. M. McGraw Drilling Co., has been transferred to Healdton, Okla., from Russellville, Ark.

**W. A. Scott,** division exploitation engineer at Billings, Mont., for Shell Oil Co., has been transferred to Denver as senior exploitation engineer. He will be replaced in Billings by **N. J. Matthews. R. S. Aberg,** division production geologist in Billings, has been given a special assignment with Shell Oil Co. of Canada. **J. E. Tuttle,** Denver, will succeed Aberg. Also moving to Billings from Denver is **M. S. French,** who will be division reserves engineer.

**Burt Clarkson,** unit supervisor in the chemical-products department at Esso Standard Oil Co.'s Bayway refinery, Linden, N. J., has been named head of the new ethylene division. Ethylene operations at Bayway recently became a separate division in the chemical-products department. **Al Sitarski** has been appointed mechanical coordinator for the ethylene project. **Dick Eustis,** formerly in the technical department, has been named technical coordinator for ethylene. **Ed Gangluff** has become coordinator of feed and product supply. As a result of these changes, **John Kennedy,** region supervisor of maintenance, has been named acting head of that division. **Frank Zusi,** construction division field engineer, has been named acting supervisor of the cracking region, maintenance division.

**E. A. Henke,** senior engineer in Shell Oil Co.'s New York engineering department, has been transferred to Anacortes, Wash., as assistant chief engineer at Shell's refinery there. At Shell's Martinez, Calif., refinery, **C. R. White,** assistant manager of the lubricating-oils department, has been promoted to manager of the distilling department. In Wilmington, Calif., **T. C. Graham,** assistant manager of the alkylation department at the refinery there, has been appointed assistant chief technologist.

**Arthur E. Bayce** has joined Shell Development Co.'s Emeryville, Calif., research center as metallurgist in the materials engineering and corrosion department. **Marvin A. Deisz** has joined the polymer and chemical applications department as a chemist. **Richard H. Crawford** has joined Shell Chemical Co.'s Norco, La., plant as a chemist.

**Joe W. Younger,** associate petroleum engineer for Ohio Oil Co. in Pauls Valley, Okla., has been moved to Bay City, Tex. **James H. Miller,** rotary-drilling foreman, has been transferred to Liberal, Kans., from Chickasha, Okla. **S. D. Powers,** geologist in Liberal, has been transferred to Oasis Oil Co. of Libya, an Ohio subsidiary.

SPROW

**Dwight B. Sprow,** formerly vice president and operating superintendent for Natural Gas Pipeline Co. of America, Texas-Illinois Natural Gas Pipeline Co. and Natural Gas Storage Co. of Illinois, has been named executive vice president of Houston Texas Gas & Oil Corp. and Coastal Transmission Corp. The two companies, subsidiaries of Houston Corp., are now building a natural-gas line from Texas to Florida. **Don A. Hardesty,** former vice president in charge of employe and public relations for Natural Gas Pipeline, Texas-Illinois Natural Gas, and Natural Gas Storage, has been appointed superintendent of pipelines for Houston Texas Gas & Oil and Coastal Transmission. **J. B. Zachry,** special representative for Worthington Corp., has joined the two companies as compressor-station superintendent. Sprow and Hardesty had been with Natural Gas Pipeline Co. since 1930. Zachry was also with this company before joining Worthington Corp. in 1935.

**J. R. Hunt** has been elected vice president in charge of the seismic division for Empire Geophysical, Inc., Fort Worth. He will be in charge of the company's Rocky Mountain regional office. Also, **Louis E. Schneider,** supervisor of the log analysis group in Atlantic Refining Co.'s geological section, has joined Empire as district engineer, logging division, in Durango, Colo. Hunt was with Pan American Petroleum Corp. before joining Empire in 1952. He is a graduate of Missouri School of Mines. Schneider had been with Atlantic since graduation from Texas College of Mines, El Paso, in 1948.

# ▶▶▶ Personals

ROGERS

**Clint D. Rogers,** manager of transmission for Cities Service Gas Co., Oklahoma City, has been elected vice president in charge of the transmission division. **Russel W. Hofsess,** manager of production and supply, has been named vice president in charge of the production and supply division. **John L. Gere,** chief engineer, becomes head of the engineering and research division. The transmission, production and supply, and engineering and research divisions were formed during a recent reorganization of the company's operating division. Rogers has been with Cities Service

HOFSESS

GERE

since 1927. He was general superintendent of operations before becoming manager of transmission in 1953. Hofsess has served as operating engineer and superintendent of the production department. He is a vice president and director of Cities Service Gas Producing Co., a subsidiary. Gere joined Cities Service in 1927. He became chief engineer in 1953 and a director in 1956.

**D. C. Clark, Jr.,** has been promoted to staff engineer in the technical division at Humble Oil & Refining Co.'s Baytown, Tex., refinery. **H. L. Cornish, L. W. Leggett, Jr., E. H. Lovering,** and **E. P. Sims** have joined the technical division at the refinery.

**George C. Roth,** director and vice president of operations for Cities Service Gas Co., has retired. He was also a director and vice president of Cities Service Gas Producing Co., a subsidiary. Roth joined Cities Service in 1913. He was named vice president in 1953.

**Robert Angevine,** Oklahoma production district superintendent for D. D. Feldman Oil & Gas, has been named superintendent of secondary-recovery operations for the company in Dallas. **Loy Hembree** will succeed Angevine as Oklahoma production superintendent.

**J. N. Conley** has been named Rocky Mountain exploration manager for Kilroy Co. of Texas, Inc. He is opening an office for the company in Denver. Conley has been chief geologist for the western division of Seaboard Oil Co. at Denver for the past 3½ years.

**Dr. Howard L. Malakoff,** head of the technical department of Petroleum Chemicals, Inc., has been named head of the company's new development department. Within the department, **Dr. J. C. Kirk,** present director of research, will head the research division. **A. L. Regnier** will head the projects analysis division.

**Raymond D. Phillips,** construction and maintenance superintendent for Continental Pipe Line Co. in Clayton, Mo., has been transferred to Hartford, Ill., as district engineer for Cherokee Pipe Line Co. Cherokee is owned by Continental and Cities Service Oil Co.

**Martin Buck,** manager of the chemical-plants department for Bataafsche Petroleum Mij. in The Hague, has been transferred to Shell Chemical Corp. as assistant to the president. **V. L. Keldsen,** section leader in Shell Chemical's head office manufacturing development department, has been named assistant manager of the department. He succeeds **F. G. Watson,** who was recently named manager of the company's Shell Point plant, Pittsburg, Calif. Buck joined Shell Oil Co. in 1930. He moved to Shell Development Co. before joining Shell Chemical in 1942. He was assigned to B.P.M. 3 years ago. Keldsen was manager of production in the ammonia division for Shell Chemical in San Francisco before moving to the New York manufacturing development department in 1955.

**R. W. McOmie,** general manager of refineries for Shell Oil Co. in New York, has been named head of a Bataafsche Petroleum Mij. refinery operating efficiency team in The Hague. The team will visit refineries of the Royal Dutch - Shell group around the world. McOmie joined Shell in 1927 as a chemist at the Martinez, Calif., refinery. He served as manager of the Wilmington, Calif., and Anacortes, Wash., refineries before becoming general manager of refineries in 1956.

BENTZ

**Keith Bentz,** superintendent of pipelines for Texas Illinois Natural Gas Pipeline Co., has been elected assistant vice president of operations. He is expected to be elected to the same office by Natural Gas Pipeline Co. of America, an affiliate. **D. T. Lutz,** field superintendent of compressor stations for Texas Illinois Natural Gas, has been named director of the employe and public-relations divisions of both companies. Lutz will move to Chicago from Malvern, Ark. The appointments take effect October 1.

**E. W. Brake,** Gulf Oil Corp.'s Oklahoma City district manager, has been named Denver division production manager. A graduate of the University of Texas, Brake joined Gulf in 1937. He was chief engineer of the Tulsa division before moving to Oklahoma City last year.

**M. F. Granville,** superintendent of the chemicals division at The Texas Co.'s Port Arthur, Tex., refinery, has been appointed general manager of the company's petrochemical department in New York. A graduate of the University of Texas and Massachusetts Institute of Technology, Granville joined Texaco in 1939. He served with the Petroleum Administration for Defense in 1951 and 1952 before becoming superintendent of the chemicals division at Port Arthur 3 years ago.

**R. H. Dourson,** manager of the catalytic cracking department at Shell Oil Co.'s Wood River, Ill., refinery, has been named special technologist there. **P. C. Bradford,** assistant manager of catalytic cracking, will move up to succeed Dourson. In other changes at Wood River, **E. W. Reiley,** assistant chief technologist, has been named manager of the alkylation department. **J. A. Marshall,** manager of gas department, will succeed Reiley as assistant chief technologist. **D. C. Lehwalder,** assistant manager of the lubricating-oils department, becomes manager of the gas department, replacing Marshall. **J. G. Pratt, Jr.,** formerly senior technologist in Shell's New York technological department, has been transferred to Wood River as manager of the aromatics department.

## Personals

**Charles J. Bryce** has been named manager of Venezuelan operations for Brown Drilling Co. Bryce was formerly superintendent for McFarland Drilling Co., Midland, Tex. A graduate of Oklahoma State University, Bryce has spent most of his career in the Permian basin. He will headquarter in Maracaibo.

**Oran L. Pack,** geologist, has opened a consulting office in Denver. He was formerly chief operations engineer with Petrobras, Brazil's government-operated oil agency.

**Victor M. Williams,** senior joint operations engineer for Sunray Mid-Continent Oil Co., has been promoted to coordinator of joint operations in the production department. Williams has been with Sunray Mid-Continent since 1948.

**A. E. McElroy** has been named supervising engineer for Pacific Northwest Pipeline Corp. He will be in charge of construction and engineering in the company's western area.

**Joseph A. Faloney,** supervisor for Sinclair Pipe Line Co. in Linden, N. J., has been transferred to Laurel Pipe Line Co. and named division chief field gager in Harrisburg, Pa. Laurel is owned by Sinclair, Gulf Oil Corp., and The Texas Co.

**Carl E. Reistle, III,** formerly a student at the University of Texas, has joined Humble Oil & Refining Co. as junior petroleum engineer in Kingsville, Tex. Reistle is the son of **Carl E. Reistle, Jr.,** executive vice president of Humble.

**Robert Jorda,** formerly division mechanical engineer for Shell Oil Co. at Long Beach, Calif., has joined Shell Development Co. in its production research laboratories at Houston. **H. L. Shatto,** formerly with Shell Development at Houston, succeeds Jorda at Long Beach.

**E. E. Strohbeck,** mechanical engineer, and **C. L. Trotter,** geologist, have been transferred by Shell Oil Co. to New Orleans from the Houston area.

**John H. McCollister** and **James L. Wallace** have been named technologists in the engineering department of Monsanto Chemicals Co.'s plastics division in Springfield, Mass. Both have been with the division since 1946.

**W. B. Cleveland,** a director of Carter Oil Co. and former Creole Petroleum Corp. executive, will return to Venezuela as a director of Creole. He replaces **Dr. W. L. Butte,** who resigned to join the University of Texas faculty. Cleveland had been with Creole 20 years before leaving the company last year on special assignment with Standard Oil Co. (N. J.). He recently had been in charge of Carter's production and research activities. During his service with Creole in Venezuela, Cleveland was acting manager of the western division, manager of the Amuay refinery, and manager of the marketing department.

## Deaths

**Paul R. Halbert,** 55, president of Lone Star Pipe Line Constructors, Inc., died September 6 in Dallas. Halbert's pipeline-construction career spanned 35 years. He started on a Prairie Pipe Line Co. gang in Kansas shortly after high school graduation in 1923. He was with Oklahoma Contracting Co. for 24 years, starting in 1928 as ditching machine oiler. He became vice president and general construction superintendent in 1941. He resigned in 1952 to organize Lone Star. Halbert built pipelines throughout the United States and Venezuela. He played a major role in construction of the War Emergency Pipeline (Big Inch) during World War II. He was a member of the API-AGA Committee on Oil and Gas Pipeline Field Welding Practices.

**Lloyd G. Smith,** 67, retired vice president and a director of Creole Petroleum Corp., died September 9 at his Media, Pa., home after a heart attack. A former general manager of the Aruba refinery operated by Lago Oil & Transport Co., he was in the refining department of Jersey Standard in New York before joining Creole in 1947. He retired in May 1956.

**David James Gribbin,** 75, retired superintendent of construction for General Petroleum Corp., died September 2 in a Santa Barbara, Calif., hospital.

**Charles E. Stout,** 57, independent producer, died September 6 at his home in Shawnee, Okla., following a heart attack. Stout was drilling superintendent for B. M. Gessell Drilling Co. during the Seminole boom. Later, as drilling superintendent for Indian Territory Illuminating Oil Co., he supervised the job of bringing Oklahoma City field's wild Mary Sudik well under control.

**Woodward Darr Clark,** 59, retired president of Royal Oil & Gas Corp., Tulsa, died September 3 at his home in Wynnewood, Pa.

**William Arthur Trout,** former vice president and general manager of Emsco Derrick & Equipment Co., died September 7 in Los Angeles after a brief illness.

**Ira Milton Moorman,** 69, retired Tidewater Oil Co. driller, died September 9 in Tulsa. Moorman was with Tidewater 33 years before retiring 4 years ago.

**Charles McKeever, Sr.,** former Tulsa drilling contractor, died September 8 at his home in Palo Alto, Calif.

**J. L. (Joe) Greer,** 58, deputy supervisor of District 8 (West Texas) of the Texas Railroad Commission and one of the commission's veteran employes, died in Midland, Tex., September 5. Greer joined the commission in 1933 in Kilgore. He also worked in the Houston office and at Austin headquarters before transferring to Midland in 1947 to supervise that district's 42 counties.

**Cash M. Young,** 76, retired Tulsa independent operator, died September 9 in a Tulsa hospital. He had undergone surgery for a ruptured appendix 2 weeks ago. Young began his oil industry career in 1898 in Ohio. He moved to Oklahoma in 1908.

**Ferd J. Spang,** 66, president of Spang & Co., Butler, Pa., oil-tool manufacturer for over 40 years, died September 10 after a major operation.

**Nathan R. (Slim) Canady,** 67, retired chief engineer at Service Pipe Line Co.'s Pauls Valley, Okla., station, died September 2 in a Tulsa hospital after a heart attack. Canady retired in 1956.

**Walter Frederick Schmuck,** 50, Tulsa independent producer, died September 10 in a Tulsa hospital.

# Crude price looks high—but . . .

IS THE PRICE of crude too high?

The average price paid across the country for oil last year was $3.09 a barrel, the highest average for the twentieth century. Prices this year probably will average slightly under that but still near a record.

Only other time since 1906 that the average price topped $3 a barrel was in 1920 when oil men averaged $3.075 a barrel for their crude.

This makes good reading for the oil producer. The price of oil is never too high for him. On the other hand, the refiner may have reservations. Whether the price is too high depends on what he can get for a barrel of products made from the crude. The consumer naturally wants the lowest price possible.

With attention currently centered on the crude-price structure because of federal antitrust action, the Journal economics department made a study of average crude prices since 1906. The only fair way of looking at oil prices was used: Comparing them to the prices of other commodities and translating the average prices into a constant dollar value (see chart).

Converted to 1947-49 dollars, crude which sold for $3.09 in 1957 had a value of $2.46. This "true price" was topped by four other years: 1920 when the value was $2.67; 1926 when the value was $2.63; and 1948 and 1949 when the value for both years was $2.51.

This switch is not statistical sleight-of-hand. It reflects the economic effect of the rising wholesale price index of all commodities oil men buy other than food. This index, based on 1947-49 as 100, was at an all-time high of 125.6 in 1957, which cheapened the high average crude price that year.

**1920 Index 115.3**

The index in 1920 stood at 115.3 which also cheapened the crude price. But in 1926 when oil men averaged $1.88 a bbl. for crude, the price index was down to 71.5. This jumped the relative value of crude.

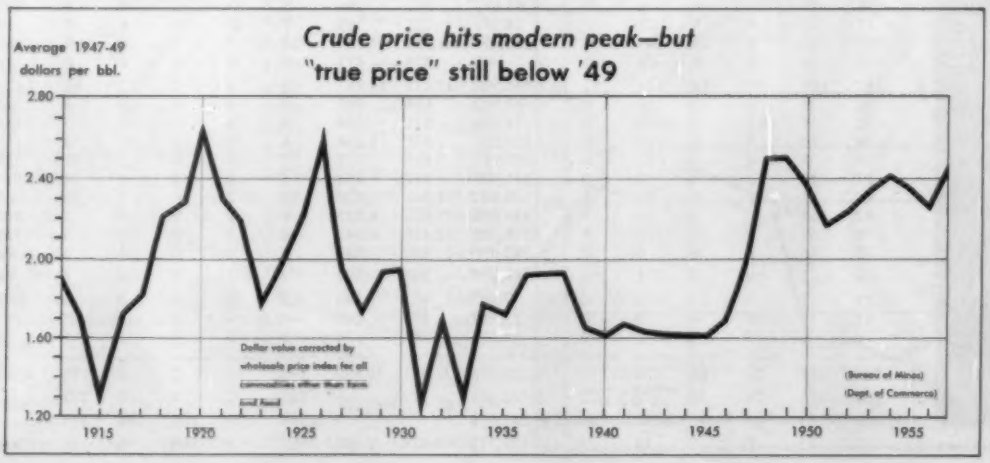
Conditions were more stable in 1948-49. The 1948 index stood at 103.4 which reduced value of the average $2.60 crude price only 9 cents. And in 1948 the index of 101.3 resulted in a 3-cent reduction in value of the average price of $2.54.

The most interesting trend is what has happened to the value of crude since 1948. During that time the index rose 22.2 points. The average price of crude rose 49 cents. But the value of crude expressed in constant 1947-49 dollars declined 5 cents a barrel.

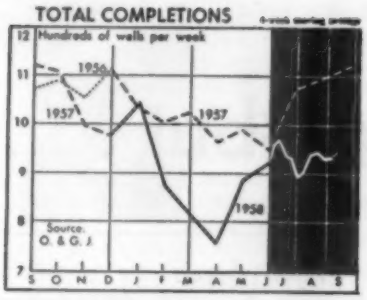
This means the oil man may be kidding himself when he thinks he's getting a record return from his crude. Four other times since 1906 he made better price deals. And actually since 1948 the value of his crude has dropped.

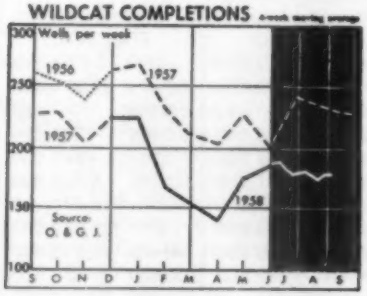
## A quick look at the highlights . . .

| | LATEST WEEK | Change from WEEK AGO | | Change from YEAR AGO | |
|---|---|---|---|---|---|
| Production | 7,063,450 | UP | 212,525 | UP | 184,594 |
| Crude stocks | 246,749,000 | DOWN | 4,292,000 | DOWN | 37,474,000 |
| Completions | 944 | UP | 83 | DOWN | 182 |
| Refinery runs | 7,982,000 | UP | 45,000 | DOWN | 288,000 |
| Gasoline stocks | 174,193,000 | UP | 723,000 | UP | 641,000 |
| Kerosine stocks | 28,865,000 | UP | 241,000 | DOWN | 5,962,000 |
| Distillate stocks | 141,209,000 | UP | 2,887,000 | DOWN | 18,677,000 |
| Residual stocks | 68,082,000 | UP | 1,064,000 | UP | 14,063,000 |
| Four-product stocks | 412,349,000 | UP | 4,915,000 | DOWN | 9,935,000 |
| Total imports | 1,390,900 | DOWN | 162,500 | DOWN | 404,300 |



## DRILLING




## Active Rotary Rigs*

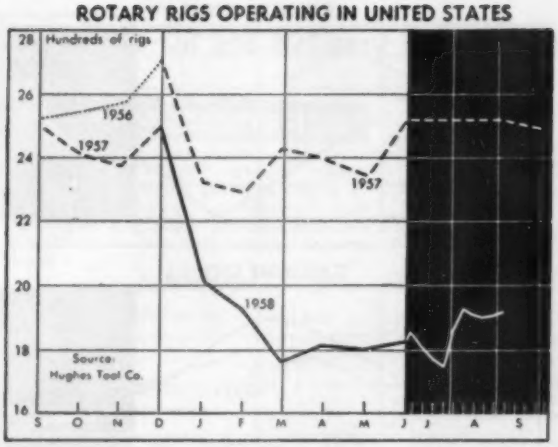
| | 9-8-58 | 9-1-58 | 9-9-57 |
|---|---|---|---|
| Alabama | 5 | 5 | 4 |
| Arkansas | 21 | 23 | 26 |
| Arizona | 2 | 3 | .... |
| California | 70 | 67 | 94 |
| Colorado | 47 | 50 | 63 |
| Florida | 1 | 1 | 1 |
| Georgia | .... | .... | .... |
| Idaho | .... | .... | .... |
| Illinois | 53 | 62 | 54 |
| Indiana | 12 | 12 | 8 |
| Iowa | 3 | 3 | 2 |
| Kansas | 146 | 159 | 151 |
| Kentucky | 6 | 5 | 10 |
| Louisiana | 304 | 302 | 442 |
| North | 39 | 34 | 67 |
| South | 228 | 233 | 276 |
| Offshore | 37 | 35 | 99 |
| Maryland | .... | .... | 1 |
| Michigan | 10 | 10 | 13 |
| Missouri | 1 | 1 | .... |
| Montana | 20 | 19 | 26 |
| Mississippi | 45 | 40 | 42 |
| Nebraska | 25 | 21 | 36 |
| Nevada | .... | .... | .... |
| New Mexico | 99 | 103 | 153 |
| New York | 2 | 2 | .... |
| North Dakota | 30 | 29 | 37 |
| Ohio | 1 | .... | .... |
| Oklahoma | 218 | 191 | 255 |
| Oregon | .... | .... | 1 |
| Pennsylvania | 9 | 9 | 14 |
| South Dakota | 3 | 3 | 1 |
| Texas | 692 | 701 | 910 |
| South-Gulf | 133 | 136 | 201 |
| Offshore | .... | .... | 4 |
| North-East | 176 | 167 | (†) |
| West Central | 224 | 220 | (†) |
| West | 159 | 178 | (†) |
| Tennessee | .... | .... | 1 |
| Utah | 30 | 22 | 68 |
| Washington | 1 | 1 | 1 |
| West Virginia | 4 | 4 | 4 |
| Wyoming | 61 | 63 | 76 |
| Virginia | .... | .... | 1 |
| Total U. S. | 1,921 | 1,911 | 2,495 |
| Western Canada | 148 | 152 | 205 |
| Eastern Canada | 3 | 4 | 3 |
| Grand total | 2,072 | 2,067 | 2,703 |

*Hughes Tool Co. †Comparisons not available due to change in method of reporting.

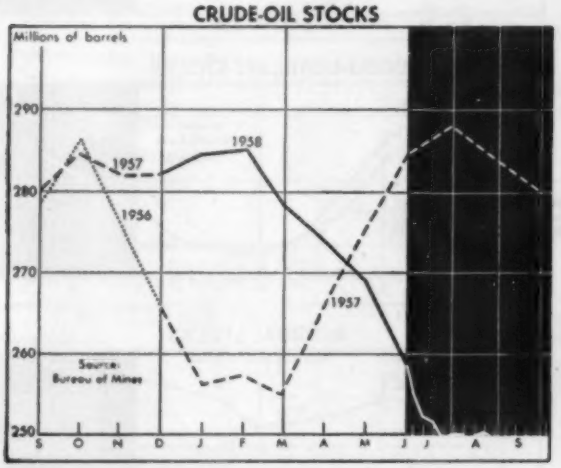
## WEEKLY WELL COMPLETIONS . . . WEEK ENDED SEPTEMBER 6, 1958

| | Total wells | | | | | | | Cumulative | | Total wildcats | | | | | Cumulative | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total | Crude | Cond. | Gas | Dry | Service | Footage | 1958 | 1957 | Total | Crude | Cond. | Gas | Dry | 1958 | 1957 |
| Alabama | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 50 | 63 | 0 | 0 | 0 | 0 | 0 | 19 | 20 |
| Arkansas | 26 | 15 | 0 | 0 | 11 | 0 | 77,365 | 504 | 759 | 2 | 0 | 0 | 0 | 2 | 112 | 136 |
| California | 19 | 9 | 0 | 0 | 10 | 0 | 68,697 | 1,098 | 1,463 | 8 | 0 | 0 | 0 | 8 | 256 | 363 |
| Colorado | 18 | 2 | 0 | 1 | 15 | 0 | 86,181 | 552 | 579 | 12 | 0 | 0 | 1 | 11 | 320 | 391 |
| Illinois | 50 | 24 | 0 | 0 | 26 | 0 | 107,310 | 1,452 | 1,761 | 11 | 0 | 0 | 0 | 11 | 287 | 442 |
| Indiana | 16 | 8 | 0 | 0 | 8 | 0 | 26,627 | 505 | 447 | 3 | 1 | 0 | 0 | 2 | 183 | 88 |
| Kansas | 78 | 27 | 0 | 6 | 43 | 2 | 268,373 | 2,547 | 2,901 | 11 | 0 | 0 | 0 | 11 | 544 | 579 |
| Kentucky | 35 | 13 | 0 | 1 | 21 | 0 | 63,888 | 779 | 994 | 13 | 1 | 0 | 0 | 12 | 98 | 200 |
| Louisiana | 63 | 38 | 5 | 1 | 19 | 0 | 480,263 | 2,323 | 2,565 | 6 | 0 | 0 | 0 | 6 | 338 | 458 |
| North | 25 | 20 | 0 | 0 | 5 | 0 | 82,772 | 836 | 927 | 3 | 0 | 0 | 0 | 3 | 139 | 123 |
| South | 29 | 14 | 3 | 1 | 11 | 0 | 307,997 | 1,176 | 1,174 | 2 | 0 | 0 | 0 | 2 | 179 | 277 |
| Offshore | 9 | 4 | 2 | 0 | 3 | 0 | 89,494 | 311 | 464 | 1 | 0 | 0 | 0 | 1 | 20 | 58 |
| Michigan | 6 | 2 | 0 | 0 | 2 | 2 | 16,214 | 282 | 280 | 0 | 0 | 0 | 0 | 0 | 91 | 103 |
| Mississippi | 8 | 6 | 0 | 0 | 2 | 0 | 59,014 | 264 | 259 | 2 | 0 | 0 | 0 | 2 | 121 | 137 |
| Montana | 10 | 5 | 0 | 0 | 5 | 0 | 55,116 | 227 | 275 | 5 | 0 | 0 | 0 | 5 | 96 | 98 |
| Nebraska | 17 | 7 | 0 | 0 | 10 | 0 | 106,632 | 480 | 602 | 8 | 1 | 0 | 0 | 7 | 224 | 333 |
| New Mexico | 37 | 13 | 1 | 11 | 12 | 0 | 158,818 | 1,350 | 1,461 | 8 | 0 | 0 | 0 | 8 | 180 | 194 |
| West | 18 | 4 | 1 | 10 | 3 | 0 | 75,896 | 652 | 592 | 2 | 0 | 0 | 0 | 2 | 76 | 72 |
| East | 19 | 9 | 0 | 1 | 9 | 0 | 82,922 | 698 | 869 | 6 | 0 | 0 | 0 | 6 | 104 | 122 |
| New York | 10 | 0 | 0 | 5 | 5 | 0 | 33,877 | 403 | 317 | 5 | 0 | 0 | 0 | 5 | 37 | 6 |
| North Dakota | 15 | 9 | 0 | 0 | 6 | 0 | 93,817 | 312 | 181 | 5 | 2 | 0 | 0 | 3 | 102 | 77 |
| Ohio | 17 | 4 | 0 | 5 | 7 | 1 | 39,854 | 725 | 769 | 1 | 0 | 0 | 0 | 1 | 12 | 9 |
| Oklahoma | 126 | 66 | 1 | 10 | 43 | 6 | 420,597 | 4,331 | 4,287 | 12 | 2 | 1 | 0 | 9 | 595 | 495 |
| Pennsylvania | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 418 | 473 | 0 | 0 | 0 | 0 | 0 | 9 | 39 |
| Texas | 362 | 195 | 17 | 14 | 124 | 12 | 1,446,501 | 12,172 | 14,983 | 72 | 5 | 1 | 2 | 64 | 2,477 | 3,647 |
| District 1 | 20 | 9 | 0 | 1 | 10 | 0 | 41,172 | 658 | 865 | 8 | 0 | 0 | 0 | 8 | 265 | 302 |
| District 2 | 12 | 4 | 3 | 1 | 4 | 0 | 74,106 | 511 | 524 | 3 | 0 | 0 | 0 | 3 | 134 | 194 |
| District 3 | 24 | 11 | 3 | 0 | 10 | 0 | 157,297 | 871 | 1,194 | 4 | 0 | 0 | 0 | 4 | 195 | 342 |
| District 4 | 33 | 9 | 4 | 3 | 17 | 0 | 167,916 | 815 | 972 | 12 | 1 | 0 | 0 | 11 | 239 | 325 |
| East | 21 | 11 | 3 | 0 | 7 | 0 | 111,308 | 832 | 894 | 5 | 0 | 1 | 0 | 4 | 229 | 261 |
| District 7-B | 61 | 25 | 1 | 1 | 33 | 1 | 149,832 | 1,643 | 1,950 | 23 | 2 | 0 | 1 | 20 | 468 | 690 |
| West | 92 | 71 | 2 | 1 | 15 | 3 | 445,838 | 3,521 | 4,255 | 8 | 1 | 0 | 0 | 7 | 487 | 610 |
| District 9 | 70 | 39 | 0 | 1 | 22 | 8 | 156,102 | 2,455 | 3,342 | 4 | 1 | 0 | 0 | 3 | 389 | 850 |
| District 10 | 29 | 16 | 1 | 6 | 6 | 0 | 142,930 | 866 | 987 | 5 | 0 | 0 | 1 | 4 | 71 | 73 |
| Utah | 4 | 2 | 0 | 1 | 1 | 0 | 18,371 | 268 | 143 | 2 | 1 | 0 | 0 | 1 | 58 | 75 |
| West Virginia | 15 | 3 | 0 | 11 | 1 | 0 | 37,982 | 492 | 448 | 0 | 0 | 0 | 0 | 0 | 12 | 20 |
| Wyoming | 11 | 5 | 0 | 0 | 6 | 0 | 53,717 | 487 | 592 | 5 | 0 | 0 | 0 | 5 | 143 | 203 |
| Misc. (S. D.) | 1 | 0 | 0 | 0 | 1 | 0 | 4,782 | 64 | 71 | 1 | 0 | 0 | 0 | 1 | 55 | 54 |
| Total U. S. | 944 | 453 | 24 | 66 | 378 | 23 | 3,723,996 | 32,085 | 36,673 | 192 | 13 | 2 | 3 | 174 | 6,369 | 8,167 |
| Prev. week | 861 | 383 | 24 | 70 | 372 | 12 | 3,522,609 | ..... | ..... | 201 | 17 | 4 | 3 | 177 | ..... | ..... |
| Cum. 1958 | 32,085 | 15,749 | 791 | 2,439 | 12,290 | 816 | 133,285,434 | ..... | ..... | 6,369 | 620 | 108 | 188 | 5,453 | ..... | ..... |
| Western Canada | 67 | 43 | 0 | 3 | 16 | 5 | 329,712 | 1,674 | 2,081 | 12 | 1 | 0 | 0 | 11 | 448 | 586 |

## ROTARY RIGS OPERATING IN UNITED STATES




## CRUDE-OIL STOCKS




## DAILY AVERAGE PRODUCTION FOR WEEK

| | September 6, 1958 Crude oil | Lease condensate | Total | August 30 total |
|---|---|---|---|---|
| Alabama | 16,175 | ..... | 16,175 | 17,150 |
| Arkansas | 73,125 | 200 | 73,325 | 73,350 |
| California | 854,000 | ..... | 854,000 | 855,800 |
| Colorado | 131,900 | ..... | 131,900 | 131,400 |
| Eastern | 46,200 | ..... | 46,200 | 46,700 |
| Florida | 1,225 | ..... | 1,225 | 1,275 |
| Illinois | 223,400 | ..... | 223,400 | 216,400 |
| Indiana | 32,500 | ..... | 32,500 | 32,400 |
| Kansas | †346,650 | ..... | †346,650 | †338,250 |
| Kentucky | 40,900 | ..... | 40,900 | 40,800 |
| Louisiana | 787,700 | 85,950 | 873,650 | 847,775 |
| North | 106,425 | 2,500 | 108,925 | 108,750 |
| South | 681,275 | 83,450 | 764,725 | 739,025 |
| Michigan | 24,700 | ..... | 24,700 | 24,300 |
| Mississippi | 101,100 | 4,200 | 105,300 | 100,550 |
| Montana | 77,000 | ..... | 77,000 | 77,300 |
| Nebraska | 58,600 | ..... | 58,600 | 59,200 |
| Nevada | 100 | ..... | 100 | 100 |
| New Mexico | 273,500 | 5,100 | 278,600 | 277,400 |
| North Dakota | 38,700 | ..... | 38,700 | 36,400 |
| Oklahoma | †587,600 | ..... | †587,600 | †562,400 |
| Texas | 2,759,850 | 63,500 | 2,823,350 | 2,689,100 |
| Dist. 1 | 47,150 | 500 | 47,650 | 45,400 |
| Dist. 2 | 124,575 | 8,300 | 132,875 | 124,200 |
| Dist. 3 | 355,725 | 31,500 | 387,225 | 376,000 |
| Dist. 4 | 207,000 | 8,100 | 215,100 | 200,000 |
| Dist. 5 | 33,425 | 375 | 33,800 | 32,275 |
| Dist. 6 | 126,275 | 6,100 | 132,375 | 123,000 |
| East Texas Field | 163,275 | ..... | 163,275 | 153,000 |
| Dist. 7-B | 151,275 | 75 | 151,350 | 142,075 |
| Dist. 7-C | 141,000 | 4,050 | 145,050 | 135,050 |
| Dist. 8 | 1,095,000 | 2,000 | 1,097,000 | 1,046,800 |
| Dist. 9 | 209,725 | 1,500 | 211,225 | 205,500 |
| Dist. 10 | 106,425 | 1,000 | 107,425 | 105,800 |
| Utah | 103,200 | ..... | 103,200 | 96,900 |
| Wyoming | 326,200 | ..... | 326,200 | 325,800 |
| Others | ‡175 | ..... | ‡175 | ‡175 |
| Total U. S. | 6,904,500 | 158,950 | 7,063,450 | 6,850,925 |
| Change from prev. week, up | | | 212,525 | ..... |
| Canada | †436,232 | ..... | †436,232 | †455,500 |

Total U. S. production, Jan. 1-Sept. 6 ..... 1,624,155,575 bbl.
Same period last year (crude plus cond.) ..... *1,820,172,285 bbl.

*Includes 34,877,605 bbl. condensate. †Week ended previous Monday. ‡South Dakota and Washington.

## CRUDE-OIL STOCKS BY STATES OF ORIGIN*

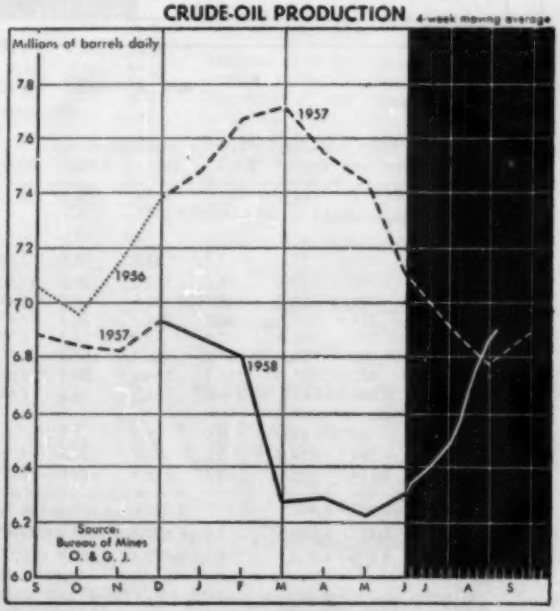
(Thousands of barrels)

| | 8-30-58 | 8-23-58 | 8-31-57 |
|---|---|---|---|
| Pennsylvania | 2,954 | 2,948 | 3,173 |
| Other Appalachian | 1,431 | 1,408 | 1,606 |
| Illinois, Indiana, Michigan | 10,653 | 11,334 | 11,105 |
| Nebraska and North Dakota | 2,244 | 2,218 | 2,621 |
| Kansas | 9,335 | 9,442 | 11,000 |
| Oklahoma | 15,407 | 15,947 | 21,555 |
| Arkansas | 1,733 | 1,705 | 2,815 |
| Louisiana | 16,767 | 16,668 | 18,840 |
| North | 2,886 | 2,964 | 2,980 |
| South | 13,881 | 13,704 | 15,860 |
| Mississippi, Alabama, Florida | 2,624 | 2,539 | 2,581 |
| New Mexico | 7,826 | 7,853 | 8,923 |
| Texas | 101,895 | 102,880 | 129,523 |
| East Texas | 7,895 | 7,713 | 10,161 |
| West Texas | 50,153 | 50,678 | 62,851 |
| Texas Gulf | 17,977 | 18,072 | 24,195 |
| Other Texas | 25,870 | 26,417 | 32,316 |
| Wyoming | 12,688 | 13,793 | 17,342 |
| Other Rocky Mountain | 8,846 | 9,305 | 6,065 |
| California | 36,792 | 36,323 | 30,458 |
| Foreign | †15,554 | 16,678 | 16,616 |
| Total | 246,749 | 251,041 | 284,223 |

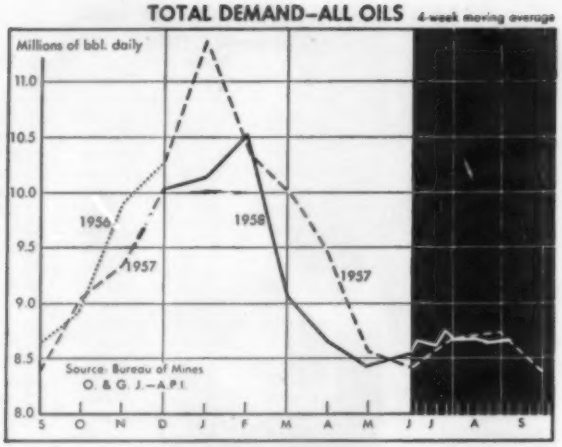
*Bureau of Mines. †Includes 4,875,000 bbl. in California.

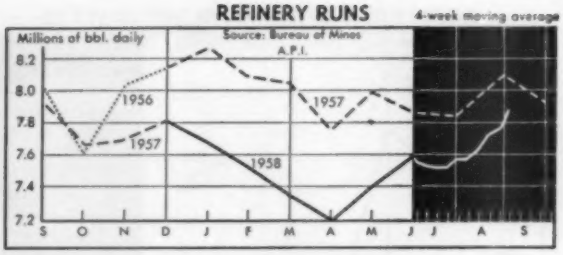
## CRUDE-OIL PRODUCTION

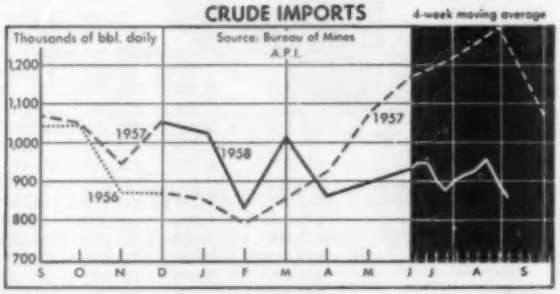
4-week moving average

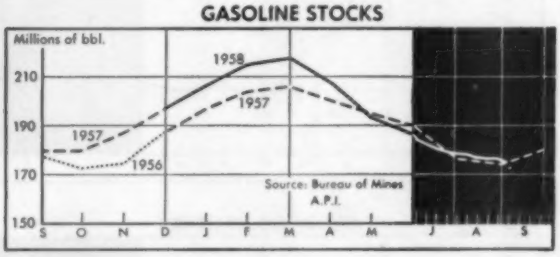


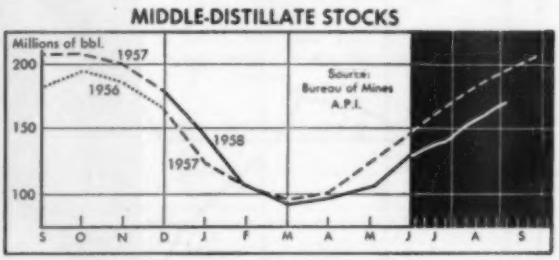
## REFINING

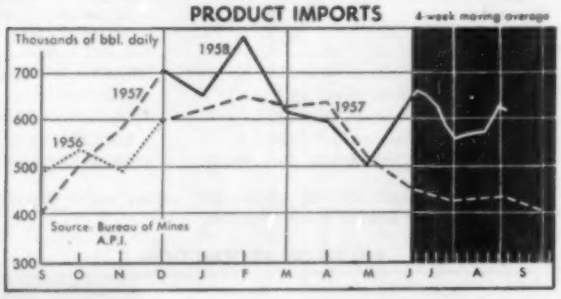


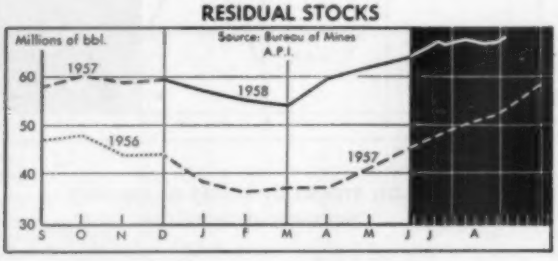




### API REFINERY REPORT—SEPTEMBER 5, 1958

(Thousands of barrels)

| District— | Daily avg. runs | Daily average production Gaso.* | Kero. | Dist. | Resid. | Stocks‡ Gaso.† | Kero. | Dist. | Resid. | Bureau of Mines, September 1957 Daily avg. runs | Daily average production Gaso.* | Kero. | Dist | Resid. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| East Coast .... | 1,171 | 518.6 | 31.0 | 323.6 | 224.2 | 38,432 | 10,744 | 48,828 | 13,245 | 1,170 | 513.8 | 20.7 | 308.1 | 193.9 |
| Appalachian: | | | | | | | | | | | | | | |
| District 1 .. | 102 | 42.9 | 1.9 | 22.0 | 5.2 | 4,227 | 568 | 3,144 | 355 | 108 | 47.2 | 2.3 | 25.1 | 6.5 |
| District 2 ... | 103 | 57.1 | 3.3 | 23.9 | 8.0 | 2,263 | 529 | 1,244 | 278 | 101 | 53.4 | 6.0 | 16.8 | 9.6 |
| Ind., Ill., Ky. .. | 1,370 | 720.4 | 58.1 | 292.0 | 118.6 | 33,501 | 7,552 | 24,327 | 5,647 | 1,408 | 729.5 | 63.0 | 290.3 | 162.3 |
| Minn., Wis., Dak. | 106 | 54.7 | 5.9 | 26.8 | 9.4 | 6,814 | 1,528 | 8,006 | 571 | 61 | 25.1 | 1.6 | 20.2 | 7.0 |
| Okla., Kans., Mo. | 714 | 427.7 | 16.1 | 174.3 | 26.4 | 17,452 | 1,780 | 13,016 | 1,044 | 704 | 413.9 | 13.3 | 173.6 | 30.9 |
| Inland Texas .. | 279 | 190.4 | 12.1 | 53.0 | 18.7 | 6,592 | 391 | 2,005 | 1,997 | 283 | 215.9 | 7.4 | 52.1 | 22.7 |
| Texas Gulf Coast | 1,873 | 964.9 | 67.3 | 466.4 | 185.4 | 22,776 | 2,581 | 14,701 | 8,689 | 1,891 | 985.3 | 111.0 | 451.0 | 228.7 |
| La. Gulf Coast | 682 | 355.1 | 34.3 | 144.1 | 50.4 | 9,088 | 1,684 | 6,305 | 1,601 | 612 | 368.2 | 35.2 | 168.9 | 49.8 |
| N. La. and Ark. | 104 | 55.2 | 6.8 | 23.7 | 6.2 | 4,640 | 827 | 2,022 | 177 | 99 | 38.0 | 7.4 | 18.9 | 6.7 |
| Rocky Mountain: | | | | | | | | | | | | | | |
| New Mexico . | 20 | 14.6 | 0.3 | 3.0 | 1.1 | 410 | 11 | 134 | 45 | 25 | 13.9 | 0.4 | 5.2 | 3.3 |
| Other Rky. Mt. | 284 | 134.0 | 2.3 | 53.9 | 34.7 | 4,722 | 301 | 3,133 | 922 | 290 | 133.1 | 3.9 | 65.6 | 39.2 |
| West Coast .... | 1,174 | 468.4 | 6.3 | 178.9 | 319.0 | 23,276 | 369 | 14,344 | 33,511 | 1,168 | 525.0 | 3.9 | 176.3 | 338.9 |
| Sept. 5, 1958 .. | 7,982 | 4,004.0 | 245.7 | 1,785.6 | 1,007.3 | 174,193 | 28,865 | 141,209 | 68,082 | 7,920 | 4,062.3 | 276.1 | 1,772.1 | 1,099.5 |
| Aug. 29, 1958 .. | 7,937 | 4,029.4 | 282.6 | 1,699.3 | 1,040.9 | 173,470 | 28,624 | 138,322 | 67,018 | ..... | ..... | ..... | ..... | ..... |
| Sept. 6, 1957 .. | 8,270 | 4,208.1 | 278.9 | 1,872.4 | 1,184.9 | 173,552 | 34,827 | 159,886 | 54,019 | ..... | ..... | ..... | ..... | ..... |

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

# Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

## REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

### GASOLINE*

| | |
|---|---|
| **Mid-Continent (Group 3):** | |
| Regular (89 octane) | 11.75-12.25 |
| Premium (99 octane) | 14.75-15.25 |
| **Gulf Coast (cargoes for coastwise or export movements):** | |
| Regular (90 octane) | 10.75 |
| Regular (92 octane) | 11.00 |
| Premium (97 octane) | 12.00-12.125 |
| Premium (98 octane) | 12.125-12.25 |
| **California (rack) (Los Angeles):** | |
| Regular (88 octane) | 11.3-11.5 |
| Premium (96 octane) | 12.8-13.0 |
| Premium (98 octane) | 13.3-13.5 |
| **Caribbean area (cargoes):** | |
| Regular (87 octane) | 10.375 |
| Premium (97 octane) | 12.125 |

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

### NATURAL GASOLINE*

| | |
|---|---|
| **Group 3:** | |
| Grade 26-70 | 4.5 |
| **Breckenridge:** | |
| Grade 26-70 | 4.0 |

*If 26-70 natural is considered as 100%, prices for lower-vapor-pressure grades increase 2.5% for each unit drop in Reid vapor pressure down to and including 16 lb. Prices for grades below 16 lb. may vary slightly by areas or plants.

### KEROSINE AND DISTILLATE

| | |
|---|---|
| **Mid-Continent (Group 3):** | |
| Kerosine 42-44 | 9.75-10.00 |
| Diesel oil (58 d.i. and above) | 9.50-9.75 |
| Distillate No. 1 | 9.50-9.75 |
| Distillate No. 2 | 8.75-9.00 |
| **Gulf Coast (cargoes):** | |
| Kerosine 41-43 | 8.875 |
| Distillate No. 2 | 8.625 |
| **New York Harbor (barges):** | |
| Kerosine 41-43 | 9.95 |
| Distillate No. 2 | 9.45 |
| Diesel fuel, 48-52 d.i. | 10.05 |
| **Caribbean area (cargoes):** | |
| Distillate No. 2 | 8.625 |

### WAX (LB.)

| | |
|---|---|
| **Oklahoma (Group 3):** | |
| 132-135 A.m.p. (semi-refined) in tank car | 6.50 |
| **New York (export):** | |
| 126-130 A.m.p. crude-scale (solid in bags or barrels) | 7.35 |

★Denotes change from previous week.

### RESIDUAL FUEL (BBL.)

| | |
|---|---|
| **Mid-Continent (Group 3):** | |
| Residual fuel (max. 1% S) | $1.30-1.35 |
| **Gulf Coast (cargoes):** | |
| Bunker C fuel | $2.20-2.25 |
| **New York Harbor (barges):** | |
| Bunker C fuel | $2.57 |
| **Caribbean (cargoes):** | |
| Bunker C | $2.25 |
| **California (rack):** | |
| Bunker C fuel, Los Angeles | $2.45 |

### LUBRICATING OILS

| | |
|---|---|
| **Mid-Continent (Group 3):** | |
| 150-160 bright stock, solvent refined, 0-10 p.p., 95 v.i. | 23.0 |
| 200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i. | 20.5 |
| **Pennsylvania Grade:** | |
| 145-155 vis. at 210, bright stock, 8 color, 25 p.t. | 22 |
| 200 vis. neutral (180° at 100°), 25 p.t. | 21 |

## CRUDE-OIL PRICES

### GRAVITY SCHEDULE

| | Signal Hill, Calif.§ | Mid-Cont.* | Gulf Coast Tex.† | West Tex.‡ N.M. | Wyo. (sour) |
|---|---|---|---|---|---|
| 14-14.9 | $2.36 | .... | .... | .... | .... |
| 15-15.9 | 2.41 | .... | .... | .... | $1.81 |
| 16-16.9 | 2.46 | .... | .... | .... | 1.86 |
| 17-17.9 | 2.51 | .... | .... | .... | 1.91 |
| 18-18.9 | 2.57 | .... | .... | .... | 1.96 |
| 19-19.9 | 2.62 | .... | .... | .... | 2.01 |
| 20-20.9 | 2.68 | $2.75 | .... | $2.62 | 2.06 |
| 21-21.9 | 2.73 | 2.77 | .... | 2.64 | 2.11 |
| 22-22.9 | 2.78 | 2.79 | .... | 2.66 | 2.16 |
| 23-23.9 | 2.84 | 2.81 | $3.44 | 2.68 | 2.21 |
| 24-24.9 | 2.89 | 2.83 | 3.46 | 2.70 | 2.26 |
| 25-25.9 | 2.95 | 2.85 | 3.48 | 2.72 | 2.31 |
| 26-26.9 | 3.00 | 2.87 | 3.50 | 2.74 | 2.36 |
| 27-27.9 | 3.06 | 2.89 | 3.52 | 2.76 | 2.49 |
| 28-28.9 | 3.11 | 2.91 | 3.54 | 2.78 | 2.54 |
| 29-29.9 | 3.16 | 2.93 | 3.56 | 2.80 | 2.59 |
| 30-30.9 | 3.22 | 2.95 | .... | 2.82 | 2.63 |
| 31-31.9 | 3.27 | 2.97 | .... | 2.84 | 2.67 |
| 32-32.9 | 3.33 | 2.99 | .... | 2.86 | 2.71 |
| 33-33.9 | 3.38 | 3.01 | .... | 2.88 | 2.75 |
| 34-34.9 | 3.44 | 3.03 | .... | 2.90 | 2.79 |
| 35-35.9 | .... | 3.05 | .... | 2.92 | 2.83 |
| 36-36.9 | .... | 3.07 | .... | 2.94 | 2.87 |
| 37-37.9 | .... | 3.09 | .... | 2.96 | 2.89 |
| 38-38.9 | .... | 3.11 | .... | 2.98 | 2.91 |
| 39-39.9 | .... | 3.13 | .... | 3.00 | 2.93 |
| 40-44.9 | .... | 3.15 | .... | 3.02 | 2.95 |

*Includes Oklahoma (sweet), part of Kansas, North Dakota, West Texas (sweet). †Low cold test crude. ‡Sour. §Some postings 3-11 cents lower.

Effective dates of broad changes: California, 6-22-58; east of California, January 3-10, 1957; Pennsylvania Grade, 6-18-58.

### FLAT PRICES

| | |
|---|---|
| **Louisiana:** | |
| Sweet Lake | $3.00 |
| Ville Platte | 3.30 |
| **Texas:** | |
| East Texas | 3.25 |
| Conroe | 3.53 |
| Van | 3.08 |
| **Pennsylvania Grade:** | |
| Bradford | 3.90 |
| Middle District | 3.72 |
| Southwest Pennsylvania | 3.43 |
| West Virginia | 3.25 |
| Buckeye Grade | 3.25 |
| **Illinois Basin** | 3.00 |
| **Canada:** | |
| Leduc-Woodbend | 2.67 |
| Redwater (Alta.) | 2.56 |
| Smiley (Sask.) | 2.33 |
| Pembina | 2.52 |

### FOREIGN

| | |
|---|---|
| **Venezuela:** | |
| Cumarebo, 48°-49.9°, Tucupido | 3.75 |
| San Joaquin, 41°-41.9°, Puerto La Cruz | 3.34 |
| Oficina, 35°-35.9°, Puerto La Cruz | 3.05 |
| Tia Juana medium, 26°-26.9°, Amuay* | 2.55 |
| Quiriquire, 16.0°-16.4°, Caripito | 2.30 |
| Lagunillas heavy, flat, Amuay or Las Piedras* | 2.25 |
| Bachaquero, flat, 15°-16°, Las Piedras* | 2.01 |

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

| | |
|---|---|
| **Middle East, Persian Gulf (cargoes, f.o.b. lifting port):** | |
| Arabian, 36.0°-36.9°, Ras Tanura | $2.12 |
| Iranian, 34.0°-34.9°, Bandar Masur | 2.04 |
| Iranian, 34.0°-34.9°, Abadan | 1.99 |
| Iraq, 35.0°-35.9°, Fao | 1.98 |
| Kuwait, 31.0°-31.9°, Mina-al-Ahmadi | 1.85 |
| Qatar, 41.0°-41.9°, Umm Said | 2.23 |
| **Middle East, E. Mediterranean:** | |
| Arabian, 36.0°-36.9°, Sidon | 2.49 |
| Iraq, 36.0°-36.9°, Tripoli, Banias | 2.49 |
| **Far East (cargoes, f.o.b. Lutong, Sarawak):** | |
| Seria Light, 37° | 2.75 |

### TANKER RATES PER LONG TON

(Latest reported spot fixtures)

| | |
|---|---|
| ★ Gulf-U.S.N.H., clean (USMC+15%) | $3.28 |
| Gulf-U.S.N.H., dirty (USMC—10%) | 2.57 |
| Carib.-U.S.N.H., dirty (USMC—47.5%) | 1.42 |
| P.G.-U.S.N.H., dirty (USMC—60%) | 5.08 |
| ★ P.G.-U.K., dirty (Scale—55%) (24s. 4d.) | 3.39 |
| ★ Carib.-U.K., dirty (Scale—50%) (16s. 3d.) | 2.27 |

# CLASSIFIED ADVERTISING

*...your market place for the oil and gas industry*

**RATES:**

UNDISPLAYED CLASSIFIED 25c a word one issue. 10% discount three or more consecutive issues. $5.00 minimum charge. Blind Box in our care nine words. Payable in advance.

**DISPLAY CLASSIFIED**
$18.00 a column inch one issue . . .
10% Discount three or more consecutive issues.

Address Classified Advertising Material: The Oil and Gas Journal, P. O. Box 1260, Tulsa 1, Okla.

**EXCEPT . . .**

WESTERN STATES: (California, Washington, Oregon, Idaho, Nevada, Utah, and Arizona) Write: Classified Departments, Inc., The Oil and Gas Journal, 4041 Marlton Ave., Los Angeles 8, Calif. Phone: AXminister 2-0281.

**FOR SALE EQUIPMENT**

1500 FAILING, 42' mast, 3½" kelly, 5 x 8 pump, 55 rig and truck. Long mast, kelly, Franks, 54 truck, 5 x 6 and 5 x 8 pump. Fred Butler, Box 481, Pueblo, Colo.

LINE PIPE, 5000' 6⅝" OD, 13 lb. plain end, 35' to 40' random lengths, clean inside and out. Good body, 50c. M. J. Regan Pipe Co., Coffeyville, Kansas.

PIPE FOR SALE—A quantity of 16", 18" and 20" O.D. good used pipe at a very low price. Must be sold immediately. Write, wire, or call, Tri State Pipe Company, P. O. Box 542, Bellaire, Ohio. Phone ORchard 6-1451.

## PUMPS—ALL NEW

Two—Bingham stuffingboxless 1½" x 2" x 8"; 70 G.P.M. @ 150 ft. with 5 hp. 220 volt 3-phase motors. For packing or sealing, gasoline plants, etc.
One—Payne Model DP-1002 piston type; working pressure to 10,000 lb. Chemicals.
Two—Texsteam Model 5001, piston type. Chemicals.
One—Texsteam TXT Slugger series 6000—piston type. Chemicals.

## BURNERS

14—Williams Oil-O-Matic for use with I or II control—oil not heavier than #2. Electric motor drive with ½ hp. 60 cycle, single phase motors. Transformers included. Four slightly used for testing. Balance new and unused.

## BUSHINGS—ALL NEW

65—3"x1¼" Malleable threaded bushings
56—3"x2" Malleable threaded bushings
35—3"x2¼" Malleable threaded bushings
49—4"x1¼" Malleable threaded bushings
48—4"x2" Malleable threaded bushings
52—4"x2½" Malleable threaded bushings
7—4"x3" Malleable threaded bushings
5—3½"x1½" Double tapped Malleable threaded bushings
5—3½"x2" Double tapped Malleable threaded bushings
28—3½"x2" Double tapped steel threaded bushings

**WRITE OR CALL:**
**N. V. Webster**
**NATIONAL TANK COMPANY**
P. O. Box 1710 Phone CH 2-9141
TULSA, OKLAHOMA

"FASTER FROM FOSTER"
TESTED & STRUCTURAL **PIPE**
Warehouse Stocks 1/8" thru 48"
Valves, Fittings, and Couplings
**L. B. FOSTER CO.**
PITTSBURGH 30 • ATLANTA 8 • NEW YORK 7
CHICAGO 4 • HOUSTON 2 • LOS ANGELES 5

**FOR SALE EQUIPMENT**

8⅝" 28 LB. LAPWELD line pipe, 600,000 ft. No. 1 grade. Indiana-Ohio Pipe Co. P. O. Box 323. Phone 3-4674, Decatur, Indiana.

SALES AND RENTALS. Used cable drilling and fishing tools, casing, production equipment; from the Southwest's largest stock of oil field supplies. Degen Pipe and Supply Co., Tulsa.

## SAVE MONEY

**On New and Reconditioned Gas Gathering Compressors**

**New**

8", 11", 13" stroke frames with compressor ends to fit working pressures from 200#-1500# packaged for immediate delivery with properly sized engines.

**Reconditioned**

1—Worthington 800 HP Stationary
1—Clark 450 HP Unitized
1—Gardner-Denver 300 HP Packaged
**Phone—wire or write for quotations**

**CARSON MACHINE & SUPPLY COMPANY**
OKLAHOMA CITY, OKLA.
P. O. Box 4547 Phone: MElrose 4-0511

**FOR SALE EQUIPMENT**

7000 FT. 3½ I.F. modified drill pipe; 4¾ tool joints; elevators; rotary slips; also, 5¾ drill collars. Box 297, Tyler, Texas.

16,000' 4½" GRADE E, API Full Hole Drill Pipe W/Hard Band. Excellent condition. Don Harman Pipe & Supply, P. O. Box 4401, OR 7-4343, Okla. City.

## FOR SALE

Two Cooper-Bessemer GMR, 225 HP gas engine driven compressors, each equipped with three cylinders. Cylinder pressures to 850 psig. Machines disassembled and skidded for shipment. May be inspected North Central Texas.
**Box K-839, The Oil and Gas Journal, Tulsa, Oklahoma.**

## NEW LINE PIPE

Prime Grade A.P.I. Spec. 5-L x 52
Electricweld, 40' DRL, Beveled
**5500' 20" O.D. x .406 wall 85.01#**
**3250' 20" O.D. x .375 wall 78.60#**
**2430' 18" O.D. x .375 wall 70.30#**
Moody inspection certificates available
Located: Harvey and New Iberia, La.
Very reasonably priced.

**MID-STATES PIPE & SUPPLY CO.**
OF LOUISIANA
Phone CHerry 2-7997 Tulsa, Oklahoma

# CLEAN UP SALE—BARGAINS GALORE

## 15 ~~20~~ DAYS TO GO

## TIDEWATER OIL CO—DRUMRIGHT, OKLA.

**CAT CRACKER EQPT. NEW 1950**

9—TOWERS 2'6" to 8' Dia.
2—PETROCHEM Heaters
1—PEABODY Airheater
10—CONDENSERS 170 to 1495 Sq. Ft.
2—REBOILERS 165 & 220 Sq. Ft.
3—CATALYST Bins & Hoppers
1—BAROMETRIC Condenser
11—STEAM PUMPS
2—CENT. PUMPS 3000 GPM 75 psi.
1—PASSENGER Elevator 182'
1—REACTOR 14' x 42'
1—KILN 18' x 55'
1—AIR BLOWER 11,000 CFM.
150—INSTRUMENTS

**OTHER ITEMS FROM CAT CRACKER TOO NUMEROUS TO MENTION**

**OTHER ITEMS**

3BB BUCYRUS-ERIE Crane & Dragline; 75 ft. Boom, long frame & wide tread cats.
CAT. D6 Tractor 74 in. ga., 16-in. shoes.
CATERPILLAR 112 Grader
210 CFM I-R Compressor Pneu. Tires
8500 GAL. ETHYL Blending Plant
AUTOMATIC Telephone Eqpt.
CROLOY Furnace Tubes New
API Oil Separator
200 TON Used Synthetic Catalyst
1000# GASOLINE Dyes
2700# DuPont Antioxident
40 TON Dusting Gypsum
16 TON Aluminum Sulphate
900—50# PAILS National Foamite

***Phone or Wire for Complete Information***

# HEAT & POWER CO., INC.

**60 East 42nd St., New York 17, N. Y., MUrray Hill 7-3280**
**310 Thompson Bldg., Tulsa 3, Oklahoma, Diamond 3-4890**
**SITE OFFICE—Drumright, Okla., Phone 569**

**FOR SALE EQUIPMENT**

C-250, C-150 IDEAL PUMPS, LROU, NKU Waukesha Engines. Two units. McFann Drilling Company, 3901 Cedar Avenue, Long Beach 7, California, Lloyd Darlington, National, Torrance, California.

**WELL DRILLS - CORE DRILLS. Everything for well and core drilling in both new and used equipment at money saving prices. Fishing tools rented. Send for bulletins. Pressey & Son, Pueblo, Colo.**

1—C-250 NATIONAL IDEAL 7¼" x 15" power slush pump driven by General Motors 12103 twin diesel engine. 3—Superior Super P.T.D.-66 diesel drilling engines with twin disc clutches & radiators. O'Neal Taylor & Company, 6102 Harrisburg, Houston, Texas.

**CARDWELL ROTARY RIGS**

Capacity 1,500' to 10,000'. Immediate delivery. Your chance to buy on liberal terms or lease with option to purchase. Inventories supplied upon request.

**CARDWELL INVESTMENT CO., INC.**
**604 Petroleum Building**
**Wichita, Kansas — AM 5-2611**

**GOOD USED DRILLING, WELL SERVICING AND CABLE TOOL RIGS AND EQUIPMENT**

**Financing or lease purchase plans available on the following:**
**ROTARY DRAW WORKS:** Cardwell RL, KL, S, HL and L; also Wilson Atlas, Super and Mogul.
**CABLE TOOL HOISTS:** Cardwell RL, KL and 3-Drum RL.
**SERVICING HOISTS:** Cardwell K200, HS & L.; also two Wilsons.
**CABLE TOOL RIGS:** variety available, including Bucyrus-Erie and Cardwell KL.
**ROTARY RIGS:** variety available, including Cardwell, Oilwell and Wilson.

**PHONE WICHITA—AMherst 7-3311 or contact the local representative for CARDWELL MANUFACTURING COMPANY**
**Box 2001, Wichita, Kansas**

**FOR SALE EQUIPMENT**

2 CATERPILLAR 3 phase light plants, 20 and 30 kilowatts, $3000.00 for the two. This is quality merchandise. Only reason for selling our load has trebled. Betz, Phone 39, Lane, Kansas.

T-16 NATIONAL Rotary Rig, complete with 5100' 4½" Drill Pipe; Walker-Neer C-32 Three Drum Spudder, mounted on 1955 International 190 Tandem, complete with all tools; Fred E. Cooper Double Drum Spudder, mounted on tandem axle float, complete with all tools; Wilson Double Drum Well Servicing Unit, mounted on GMC tandem truck, with all tools. This equipment is all in very good condition. Call or write John R. Adams, c/o Foster Drilling Co., Inc., Box 751, Cushing, Oklahoma. Phone CA 5-0274 or CA 5-3914.

**FOR SALE EQUIPMENT**

8" COUPLINGS with Dutchman, A-1 Shape, standard 8 thread line. Indiana-Ohio Pipe Co. P.O. Box 323, Decatur, Ind., Phone 34674.

**NEW PUMPS FOR SALE**
2 Gardner-Denver model PL-7 with elec. drive, 250 HP. Price $16,500.00.
3 Aldrich Vertical Triplex, 2¾ x 8, 123.4 GPM @ 2300 psi.
3 Byron-Jackson Cent., Hydropress 15" x 12", 4160' head.
New Silent Chain-Link Belt.
200' 1¼" x 7" $15.00 per foot.
Other sizes in stock: 1½" x 7", 10" and 16"
**COOK INDUSTRIES, INC.**
**Merchantville, N. J.**

## "We Own The Equipment We Advertise"

**TANKS & TOWERS**

14' x 21' x 1" Shell, Steel
12' x 43' x ⅜" Shell, Steel
9½' x 19' x ¼" Shell, T-316SS
14" x 40' Tower, 160#
18" x 23' Tower, 160#
24" x 28' Tower, 550#

6' x 75', 20 Tray, 25#
5' x 96', 40 Tray, 135#
24" x 45', 24 Tray
18" x 32', 15 Tray, 160#
24" x 42', 22 Tray, 230# T-304SS
12" x 24' 12 Tray T-316SS
30" x 20', 8 Tray, 50# T-304SS

**Valves:** Steel & SS ½" through 6"
**Furnaces:** Petro-Chem, ⅓, ¾ mil. BTU-HR.

**HEAT EXCHANGERS**

**Braun 3,388 sq. ft., steel, new**
Steel Tube: 1000, 900, 650, 500, 300, 200, sq. ft.
Adm. Tube: 2250, 2200, 1300, 900, 740, 625, 300 sq. ft.
S.S. Tube: 1228, 947, 570, 536, 380, 315, 250, 157 sq. ft.
4-6% Chr. Tube: 1000, 500 sq. ft.
Fin Tube: 73, 21, 11 sq. ft.

**PUMPS**

**Hot-Oil:** 324 gpm @ 4600'; 735 gpm @ 3100'; 400 gpm @ 2000'; 1270 gpm @ 400'.
**Water:** 10,500 gpm @ 135'

**COMPRESSORS**

IR XVG-4 Complete
Worth.: LTC-4, Gas Engine, 800 hp.
IR PVG-4 Gas Engine

**PARTIAL LIST ONLY—FOR DETAILED CIRCULAR**
**WIRE! PHONE! WRITE!**

**BRILL EQUIPMENT COMPANY**
**4101 San Jacinto St., Houston 4, Texas, JA 6-1351**
**2401 Third Ave., New York 51, N. Y., CYpress 2-5703**

# NOW LIQUIDATING

**Sinclair Oil Refinery**

**Wellsville, New York**

## MODERN 15,000 BBL. PER DAY PLANT

**May be Purchased—**

1. Complete Refinery
2. Individual Units or Components
3. Individual Pieces

**HIGHLIGHTS OF UNITS AND EQUIPMENT FOR SALE**

Propane Deresining Unit
MEK Wax and De-Waxing Plant
Barreling and Canning Facilities
Complete Light Oil Processing Plant
1,000,000 Bbls. Storage Tanks—from 500 to 37,500 Bbls.

**Including**

| | | | |
|---|---|---|---|
| Columns | Engines | Loading Racks | Stills |
| Compressors | Fittings | New Warehouse Supplies | Structural Steel |
| Condensers | Generators | Pressure Vessels | Structural Steel Buildings |
| Coolers | Heat Exchangers | Propane Tanks | Towers |
| Cooling Towers | Heaters | Pumps | Turbines |
| Electric Motors | Instruments | Scales | Valves |
| Electric Equipment | Line Pipe | Spheroid Storage Tanks | 1000's of additional items |

**Catalog Available Upon Request**

**WIRE • WRITE • PHONE**

## NEW YORK REFINERY PROJECT

**FIELD OFFICE**
**South Brooklyn Ave.**
**P. O. Box 453, Wellsville, New York**
**Phone: 2445**

**TULSA OFFICE**
**First National Building**
**P. O. Box 2305, Tulsa, Oklahoma**
**Phones: Gibson 7-1541—LUther 5-5335**

## FOR SALE EQUIPMENT

8⅝" OD—19.64# EW PE Line Pipe, 13,900 feet, 40 and 50 foot lengths. Line new, $1.55 foot at Toronto, Kansas. Box 1215, DI 3-9563, Tulsa, Oklahoma.

NATURAL GAS desulphurization plant and six and one-half miles of 3½" welded high pressure line, on top of ground. Located in McMullen County, Texas. Plant will handle 2,000 MCF of sour gas per day, containing up to 800 grains of sulphur per hundred cubic feet, and dehydrate gas to 5 and 6 pounds of water per million cubic feet. Equipment list, specifications and plant layout available on request. Plant and line sold together or separate to highest bidders. Contact Jupiter Oils, Inc., P. O. Drawer 251, Alice, Texas.

## EQUIPMENT WANTED

A COMPLETE SET of API Master Tool Joint Gauges, 2⅜, 2⅞ and 3½ inch. Box K-850, The Oil and Gas Journal, Tulsa, Oklahoma.

ONE PORTABLE PULLING UNIT; maximum depth—1,500 ft., double drum with sand line, bailer sand pump and miscellaneous equipment for tubing and rod pulling; with equipment for bailing and swabbing. Also want No. 1 used pumping units, single cylinder gas engines, electric motors, tanks, heaters and separators. Box K-851, The Oil and Gas Journal, Tulsa, Oklahoma.

1 36L BUCYRUS-ERIE Spudder, trailer mounted, not more than 5 years old, no tools or lines, preferably diesel powered. Write—Peak Petroleum Co., 217 E. Fillmore, Colo. Spgs., Colo., or phone ME 5-2858.

WANT TO BUY good Mayhew 2000 or Failing 2500 rig. Give details, including price and where rig may be inspected. Box K-857, The Oil and Gas Journal, Tulsa, Oklahoma.

INTERESTED in truck mounted rotary drilling rig capable of drilling 2,500'. Write or call: Box 1180, Dallas, Tex. RIverside 7-5707.

## HELP WANTED

GENERAL SALES MANAGER wanted by aggressive petroleum marketing company with headquarters in Tulsa. Must be experienced in sales promotion, well known in the industry and have full knowledge of specifications of petroleum products as well as pricing schedules. Some traveling necessary. Excellent opportunity with chances for advancement for right man. Please reply Box K-855, The Oil and Gas Journal, Tulsa, Oklahoma, giving age, qualifications, references and expected starting salary. All replies will be treated strictly confidential.

### OPENING FOR REFINERY SHIFT FOREMAN

Newly constructed oil refinery at Sewaren, N. J. has openings for several shift foremen. Applicants must be experienced in supervising hourly employees working on refinery units and have general knowledge of processing operations and refinery equipment. All information confidential. Salary commensurate with ability and experience. Forward resume to personnel manager indicating work experience, education, and salary requirement.

**HESS TRADING AND TRANSPORT, INC.**
**P. O. Box 631**
**Perth Amboy, N. J.**

## HELP WANTED

### OPPORTUNITY FOR REFINERY MANAGER

Unusual opportunity at our new Sewaren, New Jersey refinery for a seasoned refining executive who has had at least ten years operating and administrative experience. Must have initiative, drive, and capacity to direct all phases of complete 45,000 B/D refinery operation. Petroleum or chemical engineering background preferred. All information confidential. Salary commensurate with ability and experience. Forward resume describing education, operating experience, and salary requirement to:

**MR. LEON HESS**
**HESS TRADING AND TRANSPORT, INC.**
**P. O. BOX 631**
**PERTH AMBOY, N. J.**

FOREIGN EMPLOYMENT. List oil companies, drilling contractors, seismograph contractors, showing where apply foreign jobs, $5.00 cash. OIML Co., Box 2603, Tulsa, Okla.

PETROLEUM OR MECHANICAL ENGINEERS with drilling or production experience interested in Sales Engineering. Excellent opportunity for right men to work with highly respected, established Company. Job openings in both domestic and South American areas. Send resume to: Box K-834, The Oil and Gas Journal, Tulsa, Oklahoma.

THE POSITION YOU WANT: Oil Industry companies are looking for men to fill every conceivable kind of position. If you didn't find the position in this column that you are looking for, use a "Situation Wanted" classified advertisement to state your qualifications. Some company is probably looking for your ability. See box heading for classified rates or write The Oil and Gas Journal, Tulsa, Oklahoma.

### OPENINGS FOR REFINERY-INSTRUMENT MECHANICS

Newly constructed independent oil company refinery at Sewaren, N. J. has openings for instrument mechanics. Applicants must be experienced and capable of servicing and maintaining pneumatic, mechanical, electrical and electronic equipment. Send resume to personnel manager.

**HESS TRADING AND TRANSPORT, INC.**
**P. O. Box 631**
**Perth Amboy, N. J.**

### CHEMICAL ENGINEER WANTED

Young chemical engineer with approximately two years' refinery process operations experience for thermal engineering of heat transfer equipment. All inquiries will be held in strict confidence. Address correspondence to . . .

**E. D. ANDERSON**
**WESTERN SUPPLY COMPANY**
**P. O. Box 1888** **Tulsa, Okla.**

### OPENING FOR PROCESS SUPERINTENDENT

New refinery at Sewaren, N. J. has opening for process superintendent. Excellent opportunity for experienced individual who has ambition and ability. Applicant should have ten years refinery operating experience. Chemical engineering education preferred. All replies handled in confidence. Salary commensurate with ability and experience. Forward resume describing work history, education, and salary desired to:

**MR. LEON HESS**
**HESS TRADING AND TRANSPORT, INC.**
**P. O. BOX 631**
**PERTH AMBOY, N. J.**

## HELP WANTED

WANTED, Aggressive representatives for manufacturer of API oil well pumping equipment for growing company. Experienced production man preferred. Good opportunity with several Mid-Continent territories available. Box K-837, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED EXPERIENCED CHEMIST to work as assistant in refinery laboratory, with background in analytical testing of petroleum hydrocarbons. Pod. column and vapor fractometer experience required. Supervisory experience desirable. Modern plant in north Louisiana. Only letters of application containing full information and salary requirement considered. Write Box K-862, The Oil and Gas Journal, Tulsa, Oklahoma.

ASSISTANT DISTRICT FOREMAN—Supervision of high pressure gas transmission pipeline construction, maintenance and operation. Engineering background desired with three to five years experience in pipeline work, including supervisory responsibilities. Position offers excellent opportunity for advancement to higher management. Location New England. Send resume of education, experience and salary expected. Box K-848, The Oil and Gas Journal, Tulsa, Oklahoma.

### OPPORTUNITY FOR REFINERY ACCOUNTANT

Opening for refinery accountant. We have an excellent opportunity for senior accountant to be in charge of all refinery accounting. This is an opportunity for experienced accountant who has initiative, ambition, and ability. Applicants should have refinery or similar accounting experience. All replies kept in confidence. Salary commensurate with ability and experience. Forward resume describing work history, education and salary requirement to:

**MR. LEON HESS**
**HESS TRADING AND TRANSPORT, INC.**
**P. O. Box 631**
**Perth Amboy, N. J.**

### ENGINEERS - TOOLPUSHERS

Well established International Drilling Contractor will soon have positions available as Resident Managers of foreign operations for Engineers with extensive field experience in drilling and managerial ability.
Engineers with Toolpushing experience preferred, but will consider Engineers with drilling experience.
Attractive salary and benefits. Training in Domestic Company before foreign assignment.

**Box K-836,**
**The Oil and Gas Journal,**
**Tulsa, Oklahoma.**

## HELP WANTED

MECHANICAL ENGINEER—Minimum of 5 years experience petroleum refinery, petrochemicals plant or closely related fields. Must have working knowledge of refinery processes, equipment, utilities and preferably some maintenance background. Good opportunity to grow with a growing organization. Send complete resume and salary requirements to The Vickers Petroleum Company, Inc., Potwin, Kansas, attention Mr. F. W. Macfarline.

**OPENING FOR**
**LEAD BLENDER-REFINERY**

Independent oil company refinery at Sewaren, N. J. has opening for a gasoline blender. Must be experienced in refinery blending of gasoline, including tetra-ethyl lead, and additive blending. Send resume to personnel manager.

**HESS TRADING AND TRANSPORT, INC.**
**P. O. Box 631**
**Perth Amboy, N. J.**

**OPENING FOR**
**REFINERY SUPERVISOR**
**PLANT PROTECTION AND SAFETY**

Experienced refinery safety engineer with ability and capacity to supervise plant security and inaugurate safety program. Position at newly constructed independent oil company refinery at Sewaren, N. J. Send resume indicating experience, education, and salary requirement to personnel manager.

**HESS TRADING AND TRANSPORT, INC.**
**P. O. Box 631**
**Perth Amboy, New Jersey**

## SITUATION WANTED

PETROLEUM ENGINEER—35, registered, seven years production engineering Gulf Coast, West Texas, and Mid-Continent. Desires work in production and/or completion with small, active organization. Box K-860, The Oil and Gas Journal, Tulsa, Oklahoma.

LANDMAN-LAWYER — wide experience federal oil, gas problems Washington, D. C., seeks to represent oil company in Washington. Box K-856, The Oil and Gas Journal, Tulsa, Oklahoma.

WATER-FLOOD ENGINEER: Graduate engineer, 12-years supervisory experience, field applications, management problems; water-flood, secondary recovery operations; including development, operation, evaluation, unitization, and execution of projects. Interested in increasing production for independent. Married, age 38. Presently employed in Mid-Continent area. Box K-854, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION SUPERINTENDENT: Man in early fifties with more than 30 years practical experience in Production and Drilling with major companies desires connection with small, growing Company or Independent Producer. Many years deep and shallow well gas lift and pumping experience. Excellent physical condition. Will consider any location. Box K-859, The Oil and Gas Journal, Tulsa, Oklahoma.

**OIL FINDER**

Individual wants to find new oil. Loaded last employer with big development program. Available drillable prospects, regional maps, electric logs, Oklahoma completion cards, office equipment and facilities if desired. Masters, Geol. Eng. Twenty-three years experience in exploration geology, seismic interpretation, land, well-sitting, completions, production management.

**R. W. DUDLEY**
**608 First National Bldg.**
**Phone FOrest 5-5255 or VIctor 3-7600**
**Oklahoma City 2, Okla.**

## SITUATION WANTED

PETROLEUM ENGINEER: Graduate, registered, 35, ten years experience, geology and well completion, production, evaluation, secondary, Manager. Desire responsible position with aggressive Mid-Continent independent. Box K-863, The Oil and Gas Journal, Tulsa, Oklahoma.

REGISTERED Petroleum Engineer: B.S., 33, 7 years experience; production, waterflooding unitization, evaluation. Box K-864, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL ENGINEER. Twelve years experience major companies in process design, project engineering, construction and operation of gas processing and cycling plants, including pipeline facilities. Supervisory experience. Familiar with gas sales and products contracts. Desire position in Texas with medium size company, independent, sales organization or contractor. Box K-852, The Oil and Gas Journal, Tulsa, Oklahoma.

RESERVOIR ENGINEER, 31, married. Ten years of broad, active experience in production management, waterflooding, gas injection, reserve estimation, appraisals, and workovers. Desires responsible position with growing organization. Presently employed with major company. Box K-845, The Oil and Gas Journal, Tulsa, Oklahoma.

PHOTO-REPRODUCTION SUPERVISOR—thoroughly familiar with the needs of oil companies in photo-reproduction, (all phases), offset duplication, microfilm, microprint. Also qualify as mapping department supervisor. Complete work history on request. Box K-849, The Oil and Gas Journal, Tulsa, Oklahoma.

WATER-FLOOD ENGINEER: Graduate engineer, 12 years supervisory experience, field applications, management problems; water-flood, secondary recovery operations; including development, operation, evaluation, unitization, and execution of projects. Interested in increasing production for independent. Married, Age 38. Presently employed in Mid-Continent area. Box K-854, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST - GEOPHYSICIST, 30, B.A. Math, M.S. Geology, 6 years interpretative experience with major, desires position with consulting or small oil firm with exploration department. Detailed resume on request. Box K-830, The Oil and Gas Journal, Tulsa, Oklahoma.

COMMAND PILOT: 4,525 multi-engine hours. Rating: commercial-instrument. Most recently employed as jet test pilot for Douglas. Graduate, M.A. degree. Foreign flying experience. Howard McHenry, 1539 So. Gary, Tulsa.

## BUSINESS SERVICE

**Delaware Corporation formed and serviced. American Guaranty & Trust Company, P. O. Box 487, Wilmington, Delaware.**

## BUSINESS SERVICES

**H. H. JONES & ASSOCIATES**
Consultants
Natural Gas & Gasoline Plant
EVALUATIONS
DESIGN
GAS CONTRACTS
24 YEAR BACKGROUND
**408 DAVIS BLDG., DALLAS**
**Riverside 1-4367**

## LEASE AND DRILLING BLOCKS

WANTED—Oil & Gas Royalties for Investment. Commonwealth Trust Co. P. O. Box 350, Wilmington 99, Delaware.

FOR SALE—10,000 plus acres, 2 to 5 years oil leases in Breckinridge County, Kentucky. Will sell or deal for an over-ride. P. O. Box 187, Hardinsburg, Ky.

500 ACRE DRILLING BLOCK, Pawnee County, Oklahoma. Nearby production. Box K-858, The Oil and Gas Journal, Tulsa, Oklahoma.

DRILLING DEALS WANTED. Beaver, Oklahoma; Lipscomb, Ochiltree and Hansford Counties, Texas. All details first submittal. Mayflo Oil Company, 930 Republic National Bank Bldg., Dallas, Texas.

2200 ACRE LEASE—middle of area leased solid, between two tests now starting. Good Geological structure. Very reasonable. All or part. Box 621, Phoenix, Arizona.

FOR SALE: New 10 year term, 200 acre oil and gas lease, L. C. Estes Survey, Shelby County, Texas, hot play. $5.00 per acre. Write C. A. Parker, Box 507, Center, Texas.

**ALASKA**
**Cook Inlet Basin, West Foreland Area:** 20,000 acres. 1/8th override. $15.00 per lease acre.
**Copper River Basin:** 2,560 acres. 1/4th override. $1.00 per lease acre.
**Kandik Area:** 20,000 acres. 1/8th override. $1.00 per acre.
**LLOYD E. HONSINGER,**
**1702 Twining Avenue, Anchorage, Alaska**

## BUSINESS OPPORTUNITIES

LISTED OIL COMPANY
is interested in the acquisition of Independent Oil Companies or Private Production through purchase or merger. Give full details in first letter. Box K-838, The Oil and Gas Journal, Tulsa, Oklahoma.

**MONEY NOW READY for your producing oil royalties large or small. All inquiries promptly answered. P. O. Box 2185, Denver, Colorado.**

WEST COAST Warehousing Distributor of Stainless & Alloy Pipe Valves & Fittings require additional lines and specialties for Refinery, Chemical and Missile Industry. Box K-865, The Oil and Gas Journal, Tulsa, Oklahoma.

**67 NEW CUSTOMERS**
gained by one company this year, directly from our custom sales magazines. Cost, under $100 monthly. These popular booklets entertain as they advertise. Published under your name, they make new friends for you, while keeping the old. Exclusive rights. Write (business stationery) for facts, sample.
**RADSTONE MAGAZINES**
**4200 W. Burbank Blvd., Burbank, Calif.**

**GAS DISTRIBUTION COMPANY FOR SALE**
Near Tulsa. 1,000 meters. 10 employees. Gross income about $100,000 yearly. To settle an estate is reason for selling.
**George Bauer**
**GEORGE BAUER & ASSOCIATES**
**CHEROKEE COMPANY**
**2601 East 15th**
**Tulsa—Phone WEbster 3-3020**

## MANAGEMENT SERVICE

## MANAGEMENT SERVICE

***Specializing since 1924 in***
**ACQUISITIONS**
**and**
**DIVESTMENTS**

**Assistance to Management in Expansion and Diversification**

**Mr. Emanuel Lazarus Stone**
**3220 Hudson Blvd., Jersey City 6, N. J.**
**Telephone SWarthmore 5-0201** **Cable Address: Elmaston**

**SCOUTING**

THE ALASKA OIL SCOUT—"Your personal Alaska landman." Complete research & filing service. Status Reports—Maps—Information. 1702-J Twining Avenue, Anchorage, Alaska.

**PERSONALS**

PAN AMERICAN CONSULTANTS, a newly formed partnership specializing in oil and gas development in Latin America has opened offices in the Maryland Casualty Building in New Orleans, and the Ambar Motor Building in Havana, Cuba. The partnership is composed of John F. Bricker, Management: Fernando Freyre, Legal; James R. Crow, Geological.

**PRODUCTION WANTED**

WANTED: Oil properties, 100 to 5,000 barrels daily in Oklahoma and Kansas. Morris Sitrin, P. O. Box 1160, Tulsa, Okla.

**PRODUCTION WANTED**

PRINCIPALS with unlimited funds seek any-sized oil-gas production. Give details; strict confidence. Box K-774, The Oil and Gas Journal, Tulsa, Oklahoma.

**ELECTRIC LOG CABINETS**

FOR ECONOMICAL FILING of full-size electric logs, most geologists prefer Kraftbilt E-24 4-drawer cabinet. Two compartments to each drawer with separate follow blocks make this cabinet handy, economical. For filing reduced electric logs, geologists use Kraftbilt E-28 8-drawer cabinet. Send for catalog 58-B. Ross-Martin Co., P. O. Box 800-A, Tulsa, Okla.

**MONEY RAISING**

FINANCIAL CONTACTS, Underwriters, Brokers, Private Finders of Capital reached. No shopping. Confidential. FREE ENTERPRISE ASSOCIATES, 817—51st St., Brooklyn, N. Y.


# SUCCESSFUL WILDCATS

## MICHIGAN

Montcalm County: Russell Otterbine 1 Zylstra, SE SE SE 29-12n-9w, Winfield Township, 2½ miles south Reynolds oil field; IPF: 2 bbl. oil per hour through 6/64-in. choke. Elev. 914 ft., Traverse 2,755 ft., lime 2,788 ft., Dundee 3,239 ft., pay 3,337 ft. TD 3,342 ft. (New oil pool).

## OKLAHOMA

Beaver County: Shell Oil Co. 1 Schwab, C SE SW 34-1n-26eCM. IP 837 M.c.f. of gas per day, 9 BOPD, 11 BWPD, 51°, Morrow 8,431-42 ft. TD 8,801 ft.

Comanche County: Owens Drilling Co. 1 Bruce, NE NE NE SW 35-2n-10w. IP 20 BOPD, sand 1,060-68 ft. TD 1,200 ft.

Grant County: Kirkpatrick Oil Co. 1 Lawrence, SW NE SE 1-27n-8w. IP 9,216 M.c.f. of gas per day, 50°, Cherokee 5,004-36 ft. TD 5,125 ft.

Harper County: Sinclair Oil & Gas Co. 1 M. A. Holcomb, C NE NW 7-28n-22w. IPF 314 BOPD, 58.5°, Arbuckle 7,664 to 7,717 ft. TD 7,891 ft.

Kiowa County: L. W. Monzingo 1 R. R. Cline, SW SE SW NW 5-6n-16w. IP 22 BOPD, sand and lime 459-63 ft. TD 463 ft.

Logan County: Domestic Oil Co. 1 Robinson, NE NE SW 23-16n-4w. IP 204 BOPD, 41°, Bartlesville 5,918-24 ft. TD 6,613 ft.

T. P. Petroleum Co. 1 Donohue, NW SE 21-18n-2w. IP 15 BOPD, 38°, 5,312-32 ft. TD 5,405 ft.

Murray County: Continental Oil Co. 1 M. S. Greer, SW SE 34-1n-2e. IP 191 BOPD, 40 M.c.f. of gas per day, 29.6°, third Bromide sand 3,939-40 ft.

Noble County: Anderson Petroleum Co. 1 L. L. Curby, NW NW NE 22-24n-2w. IP 3,780 M.c.f. of gas per day, Miss. chat 4,430-43 ft. TD 4,509 ft.

Okmulgee County: James C. Meade 1 Barnett, SW NW SE NE 36-11n-12e. IP 26,500 M.c.f. of gas per day, Cromwell 3,269-81 ft.; 3,320-61 ft. TD 4,099 ft.

Seminole County: Bevelhymer & Smith 1 Reed, SW SE NW 11-7n-7e. IP 1,480 BOPD, 41.4°. Booch 3,338-62 ft. TD 3,404 ft.

## KANSAS

Butler County: Augusta Oil Co. 1 Claassen, SE SE SW 7-24s-4e. IP 37 BOPD, 75% b.s. and w., 43°, Miss. 2,492-98 ft. TD 2,498 ft. Opens East Mellor pool.

Augusta 1 Mellor, NW NW SE 24-24s-4e. IP 43 BOPD, 42°, Miss. 2,515-34 ft. TD 2,534 ft. Opens Plum Gove pool.

Cowley County: Shawver-Armour 1 Mueller, SE SE NW 2-30s-3e. IP 58 BOPD, 1% b.s. and w., Cherokee 3,067-73 ft. TD 3,185 ft. Opens Maple pool.

Ayesh Oil Co. 1 Peck, NW NW NW 9-35s-4e. IP 1,000 M.c.f. of gas per day, 48 BOPD, Bartlesville sand 3,221-25 ft. TD 3,374 ft. Opens Peck pool.

## COLORADO

Garfield County: American Metals Climax, Inc., 1 Northwest Prairie Canyon-Government, 33-7s-104w. IP 3,100 M.c.f. of gas per day, Dakota 3,674-94 ft., 3,707-29 ft. TD 4,380 ft.

LaPlata County: Hathaway Drilling Co. 2 Dudley, SW SW NW 23-33n-12w. IP 4 BOPD, 38°. Mancos 2,380-2,630 ft. TD 3,060 ft.

Cherokee Drilling Co. 1-A Taylor, Red Mesa area. IP 569 M.c.f. of gas per day, Cliffhouse 722-781 ft. TD 782 ft.

Logan County: Shawnee 1 State "R," C SE SE 20-7n-52w. IP 65 BOPD, 2 BWPD, 4,476½-79½ ft. TD 4,584 ft. Opens Sandy Hill pool.

Mesa County: Aldred McLane-El Paso Natural Gas Co. 1 Conoco - Government, 8-9s-92w. IP 1,553 M.c.f of gas per day, Morapas 8,414-20 ft., 8,422-8,450 ft., 8,458-64 ft. TD 8,627 ft. Opens Buzzard Creek field.

L Skyline-Hittle, NE¼ 12-10s-96w. IP 2,419 M.c.f. of gas per day, Morapas 4,400 to 4,508 ft. TD 4,795 ft. Opens Buzzard Creek gas field.

Nebraska Drillers 1 Michelson-Government, S½ SW SW 15-11n-94w. IP 1,536 M.c.f. of gas per day, Mesaverde 5,530 to 5,651 ft. TD 6,808 ft. Opens Grand Mesa field.

Rio Blanco County: Equity Oil Co. 3 Sulphur Creek - Government, 23-2s-98w. IP 25 BOPD, Wasatch 4,736-4,836 ft. TD 7,572 ft.

1 Sulphur Creek-Government, 24-2s-98w. IP 2,980 M.c.f. of gas per day, Mesaverde 6,839-7,522 ft. TD 7,522 ft. Opens Sulphur Creek field.

4 Sulphur Creek-Boiss, 27-2s-98w. IP 2,000 M.c.f. of gas per day, Wasatch 4,118-28 ft. TD 5,035 ft. Discovery at Sulphur Creek.

2 Sulphur Creek-Government, 19-2s-97w. IP 100 BOPD, 28.7°, Green River 2,317-32 ft., 2,335-40 ft. TD 2,410 ft.

1 South Sulphur Creek-Government, 26-3s-99w. IP 2,000 M.c.f. of gas per day, Wasatch and Fort Union 4,098-4,127 ft., Mesaverde 4,861-86 ft. TD 6,951 ft. Discovery of South Sulphur Creek field.

Washington County: Kimbark 2 Simpson, C NW NE 23-1s-55w. IP 50 BOPD, 4,797-4,802 ft. TD 4,901 ft.

Emery County: American Petrofina-English Oil Co. 1-14 Snow, 14-20s-7e. IP 400 M.c.f. of gas per day, Ferron 702-718 ft. TD 922 ft.

San Juan County: Carter 8 Bluff Bench, 21-40s-22e. IP 264 BOPD, 40.6°, Hermosa 5,344-76 ft. TD 5,585 ft. Bluff Bench discovery.

**Do You Read Oil and Gas Journal Classified Pages?**

**. . . So do most of our other Subscribers!**

That's why these pages are called:

**The Market Place Of The Oil Industry**

—to buy or sell equipment—to find personnel or a position—to buy or sell production, royalties, acreage or real estate—for business opportunities—or to publicize professional services, maps, or field records.

And the cost is reasonable:—26¢ per word or $18. per column inch. Minimum: $5. for word ad or 1 in. for display ad. 10% reduction for running same copy in three or more consecutive issues. This ad is 2 columns wide and 4 inches deep, or 8 column inches.

We will be glad to help you phrase your classified ad or give you the cost of running it. Send your inquiry or copy now:

**WRITE: The Oil and Gas Journal** 211 South Cheyenne Tulsa, Oklahoma

# ADVERTISERS in this issue


ACF Industries, Incorporated, Valve Division ..... 20
Ajax Iron Works ..... 74
Allis-Chalmers
Construction Machinery Division ..... 209, 210, 211, 212
General Products Division ..... 18
Allis Co., The Louis ..... 34
Aluminum Co. of America ..... 76
American Air Filter Co., Inc. ..... 27
American Blower Division ..... 31
American Hoist & Derrick Company ..... 288
American Petroleum Institute ..... 233
American-Standard
American Blower Division ..... 31
Detroit Controls Division, Norwood Controls Division ..... 58, 59
Anderson Company, The V. D. ..... 264
Appleton Electric Company ..... 46
Arkla Air Conditioning Corp. ..... 199
Armstrong Machine Works ..... 273
Automatic Electric Sales Company ..... 197
B and W Inc. ..... 249

Baker Oil Tools, Inc. ..... 96
Bechtel Corporation ..... 161
Bethlehem Supply Company ..... 79
Bingham Pump Company ..... 184, 185
Black, Sivalls & Bryson, Inc. ..... 47, 263
Blyth & Co., Inc. ..... 230, 296
Boston Woven Hose & Rubber Company ..... 94
Bovaird Supply Co., The ..... 1
Braden Steel Corporation ..... 278
BrakeSol, Inc. ..... 215
Briggs Filtration Company, The ..... 188
British Petroleum Company Limited, The ..... 227
Brodie Co., Inc., Ralph N. ..... 39
Bucyrus-Erie ..... 81
Burden Construction Corporation, O. R. ..... 199
Burgess-Manning Company ..... 256

Canadian Bank of Commerce, The ..... 261
Central Scientific Co. ..... 198
Chance Co., A. B. ..... 198
Chicago Pneumatic Tool Company ..... 89
Classified Advertising ..... 310, 311, 312, 313, 314
Cleveland Trencher Company, The ..... 219
Climax Engine Manufacturing Co. Division of Waukesha Motor Company ..... 67
Colorado Fuel and Iron Corp. ..... 155
Continental Motors Corp. ..... 70
Cook Company, C. Lee ..... 66
Cooper, Inc., Fred E. ..... 138, 139
Coppus Engineering Corp. ..... 5
Corrosion Services Incorporated ..... 290
Crane Co. ..... 135
Crane Packing Company ..... 274
Crosby-Laughlin Division, American Hoist & Derrick Company ..... 288
Crose Manufacturing Co., Inc., M. J. ..... 169

Darling Valve and Mfg. Co. ..... 87
Delta Engineering Sales Co. ..... 258
Diesel Energy Corporation ..... 91
Dowell ..... 242, Inside Back Cover
Drilling & Service, Inc. ..... 291
du Pont ..... 37, 38

Eastman Chemical Products, Inc. ..... 143
Edward Valves, Inc. ..... 28, 29
Electric Machinery Mfg. Company ..... 220
Electro Rust-Proofing Corporation ..... 88
Ensign Carburetor Company ..... 78

Fairbanks, Morse & Co. ..... 4
Falk Corporation, The ..... 14
Farrel-Birmingham Co., Inc. ..... 61
First National Bank in Dallas ..... 245
First National Bank of Shreveport, The ..... 256
First National Bank & Trust Co. of Tulsa, The ..... 265
Fisher Governor Company ..... 63
Flexitallic Gasket Company ..... 177
Fluid Packed Pump Company ..... 86
Foxboro Company, The ..... 22
Fulton & Company, R. H. ..... 202

Gardner-Denver Company ..... 15
Gaso Pump & Burner Mfg. Co. ..... 52
General American Transportation Corporation ..... 225
Geolograph Oil Field Services ..... 290
Goodall Rubber Company ..... 255
Goodrich Chemical Company, B. F. (Geon) ..... 7
Graver Tank and Mfg. Co., Inc. ..... 69
Grayco Constructors, Inc. ..... 208
Grove Valve and Regulator Company ..... 32

H & M Pipe Beveling Machine Co. ..... 166
Haering & Co., Inc., D. W. ..... 175
Halliburton Oil Well Cementing Co. ..... 8, 9, 248
Harrisburg Steel Co. ..... 265
Hill, Hubbell and Company Division of General Paint Corporation ..... 64
Houston Contracting Company ..... 215
Huey & Co., S. E. ..... 178
Hughes Tool Co. ..... Back Cover
Hughey & Phillips, Inc. ..... 178

Ingersoll-Rand ..... 56

Jones & Laughlin Steel Corporation ..... 207
Jones & Laughlin Supply Division ..... 98, 99

Kaiser Engineers Division of Henry J. Kaiser Company ..... 90
Kellogg Co., The M. W. ..... 44
Kellogg Switchboard and Supply Company ..... 195
KLM Royal Dutch Airlines ..... 275
Kohler Co. ..... 250

Larkin Packer Company, Inc. ..... 251
Layne & Bowler, Inc. ..... 82
Le Grand Rochester Limited ..... 289
Leland Equipment Co. ..... 53
LimiTorque Corporation ..... 35
Link-Belt Company ..... 33
L-O-F Glass Fibers Company ..... 73
Lone Star Cement Corporation ..... 100
Lone Star Constructors ..... 178

Macwhyte Wire Rope Company ..... 11
Maintenance Mechanical Corporation ..... 181
Manning, Maxwell & Moore, Inc. ..... 51
Marathon Electric Manufacturing Corporation ..... 234
Marsh Instrument Co. ..... 10
Massey-Ferguson Industrial Division ..... 13
Matthews & Kenan, Consulting Engineers ..... 159
Mavor-Kelly Co. ..... 198
Maxim Silencer Company, The ..... 257
McDonald Company, B. F. ..... 281
McKee & Co., Arthur G. ..... 40
McKee-Raymond ..... 40
Meadows, Inc., W. R. ..... 215
Midwest Piping Company, Inc. ..... 45
Midwestern Pipe Line Products Co. ..... 83
Mixing Equipment Co., Inc. ..... 216
Modern Welding Company Incorporated ..... 77
Motorola Communications & Electronics, Inc. ..... 156
Mueller Co. ..... 71, 72
Murphy Manufacturer, Frank W. ..... 281

Nash Engineering Co. ..... 80
National Airoil Burner Co., The ..... 277
National Bank of Tulsa ..... 267
National Supply Co., The ..... 297, 298, 299, 300
National Tank Company ..... 316
Naylor Pipe Company ..... 26
Neill and Company, Inc., J. P. ..... 270
Nordberg Mfg. Co. ..... 24, 25
Nordstrom Valve Division, Rockwell Manufacturing Company ..... Inside Front Cover
Northwest Engineering Company ..... 259
Norwood Controls Unit, Detroit Controls Division, American Standard ..... 58, 59

Oil and Gas Journal, The ..... 85
Oil Equipment Mfg. Co., Incorporated ..... 276
Oil Well Supply Division ..... 6
Onan & Sons, Inc., D. W. ..... 264
Parkhill Truck Company ..... 218

Peerless Pump Division of Food Machinery & Chemical Corporation ..... 179
Penberthy Manufacturing Company ..... 84
Penn Controls, Inc. ..... 268
Pennsylvania Flexible Metallic Tubing Company, Inc. ..... 199
Perrault Equipment Company ..... 187
Petroleum Distributing Co. ..... 250
Petroleum Electric Power Assn. ..... 36
Philadelphia Gear Corporation ..... 35
Pipe Line Service Corp. ..... 16, 17
Pipe Line Technologists, Inc. ..... 221
Polyken Sales Division, The Kendall Company ..... 252, 253
Porter Company, Inc., H. K.—Forge and Fittings Division ..... 93
Price Company, H. C. ..... 167
Public Service Company of Oklahoma ..... 151

Raymond International Inc. ..... 40
Rector Well Equipment Co., Inc. ..... 262
Republic National Bank of Dallas ..... 288
Ridge Tool Company, The ..... 275
Rolatape, Inc. ..... 276
Ross-Martin Co. ..... 281

Sachse Electric Inc. ..... 178
Shand and Jurs Company ..... 75
Sheehan Pipe Line Construction Co. ..... 206
Sherman Products, Inc. ..... 48
Smith Corporation, A. O.—Tubular Products Division ..... 164, 165
Southwest Industries, Inc. ..... 42, 43
Southwestern Industrial Electronics Co. ..... 49
Southwestern Plastic Pipe Co. ..... 269
Standard Oil Company (New Jersey) ..... 19
Standard Pipeprotection Inc. ..... 168
Stearns-Roger Mfg. Co., The ..... 60
Stewart & Stevenson Services, Inc. ..... 50
Stoody Co. ..... 137
Stran-Steel Corporation ..... 55
Sunshine Iron Works ..... 268

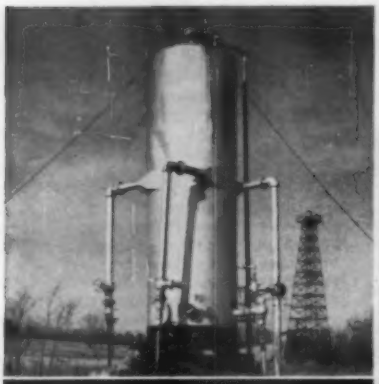
Tennessee Gas Transmission Company ..... 92
Texas Employers Insurance Association ..... 12
Thornhill-Craver Co. ..... 54
Timken Roller Bearing Company, Steel and Tube Division ..... 62
Tinker & Rasor ..... 196
Torrington Company, The ..... 282
Tower Construction Co. ..... 204
Transcontinental Gas Pipe Line Corporation ..... 188
Trerice Co., H. O. ..... 256
Tretolite Company, A Division of Petrolite Corporation ..... 57
Tube-Kote, Inc. ..... 172, 173

Union Switch & Signal Division of Westinghouse Air Brake Company ..... 23
United States Borax & Chemical Corporation Pacific Coast Borax Company Division ..... 266
United States Steel Corporation ..... 260
Oil Well Supply Division ..... 6
United Steel Companies Limited ..... 231
Universal Oil Products Co. ..... 21, 68

Valley Electric Corp. ..... 269
Victaulic Co. of America ..... 271

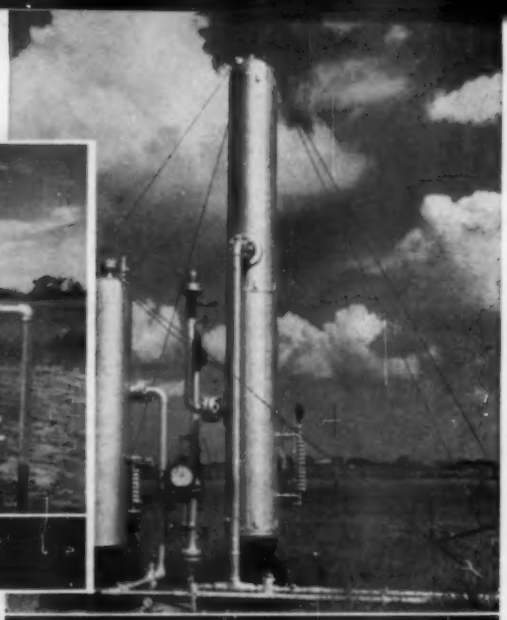
Wallace & Tiernan Incorporated ..... 88
Warner Lewis Company ..... 146
Waukesha Motor Company ..... 228
Well Equipment Mfg. Corp. ..... 41
Wheatland Tube Company ..... 30
Wheeling Machine Products Company ..... 280
White Diesel Engine Division, The White Motor Company ..... 65
Whitmor Homebuilders, Inc. ..... 292
Williams Brothers ..... 279
Williamson, Inc., T. D. ..... 180
Wilson-Snyder Works, Oil Well Supply Division ..... 6
Wisconsin Motor Corporation ..... 186
W-K-M Division of ACF Industries Incorporated ..... 20
Worthington Corporation ..... 189, 190, 191, 192
Youngstown Sheet and Tube Company ..... 246, 247

*"Yes, they're Engineered"*



One of the First National Separators. Set September, 1927. Still in service after 31 years. Oklahoma.

National "COG"® Separator (Conservation Oil & Gas)



Special 3000 psi Separator in Louisiana. Installed 1935. Still on the job after 23 years of service.

# National® Vertical Separators

**for efficient, economical separation of oil and gas**

RESULT OF OVER 30 YEARS' EXPERIENCE IN SEPARATION DESIGN AND FABRICATION

PROVED IN SERVICE IN ALL OF THE MAJOR OIL FIELDS OF THE WORLD

All known scientific principles of separation have been incorporated into the design and fabrication of National Vertical Separators.

- Expansion
- Scrubbing through perforations
- Centrifugal scrubbing against walls
- Impinging on walls
- Quieting chamber

**NATIONAL LOW PRESSURE SEPARATORS**

Working pressures from 0 to 150 psi
Standard or ASME construction

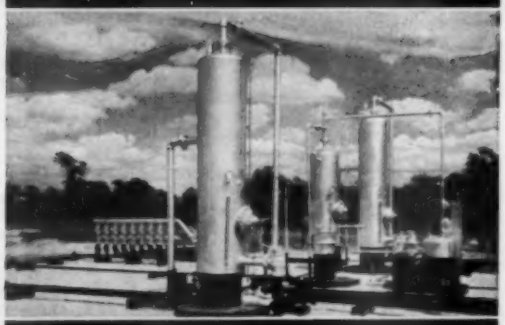
**NATIONAL HIGH PRESSURE SEPARATORS**

Working pressures to 4000 psi
ASME construction

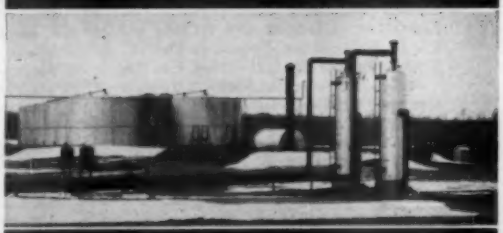
**THERE IS NO POINT WITHIN THE RATED CAPACITY AT WHICH NATIONAL UNITS DO NOT SEPARATE EFFICIENTLY**

**"It's what's in a Separator that Counts!
It's what controls a Separator that Satisfies"**

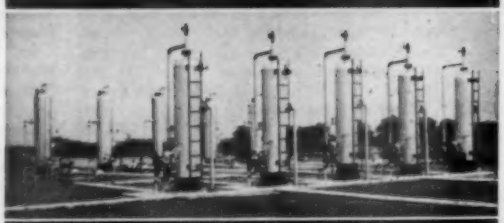
Use National Separators and get top Performance



Low Pressure Separators serve 18 wells in unitized pressure maintenance system. Oklahoma.



Low Pressure Separators, Indirect Heater and Bolted Tanks in Canada.



Low and High Pressure Separators in Stage Separation installation. Louisiana.

It's a National®

## NATIONAL TANK COMPANY

TULSA, OKLAHOMA

# What This Dow ell Research Group Means To You

This Dowell Research Group cludes four PhD's and four chemical engineers. Th are huddling on a particularly knotty production oblem for one of Dowell's customers.

At Dowell's Tulsa Research nter there are ten such teams. Their job is to pool ir skills and knowledge to help you produce oil and gas more efficiently.

This Tulsa research group is only part of the Dowell Research Story, however. Many of your problems are solved in the field by skilled petroleum engineers and field laboratory personnel. Still a third level of basic research is available to the Dowell customer when necessary—the vast laboratory facilities of The Dow Chemical Company.

Think your problem is unique? Or tough?

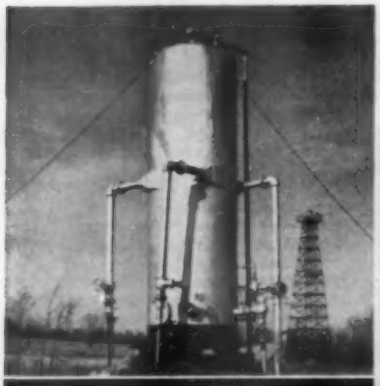
Call for a huddle with a Dowell research group. Because their work covers such a wide area, chances are they already have some data that will prove helpful in solving your problem. If they don't, you can be sure you'll get their undivided attention and a wealth of experience.

Dowell, Tulsa, Oklahoma.

*Services for the oil industry* DOWELL

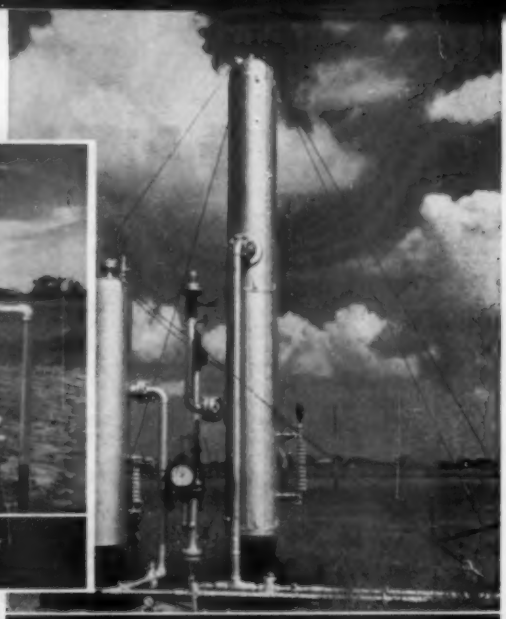
A SERVICE DIVISION OF THE DOW CHEMICAL COMPANY

*"Yes, they're Engineered"*



One of the First National Separators. Set September, 1927. Still in service after 31 years. Oklahoma.

National "COG"® Separator (Conservation Oil & Gas)



Special 3000 psi Separator in Louisiana. Installed 1935. Still on the job after 23 years of service.

# National® Vertical Separators

**for efficient, economical separation of oil and gas**

RESULT OF OVER 30 YEARS' EXPERIENCE IN SEPARATION DESIGN AND FABRICATION

PROVED IN SERVICE IN ALL OF THE MAJOR OIL FIELDS OF THE WORLD

All known scientific principles of separation have been incorporated into the design and fabrication of National Vertical Separators.

- Expansion
- Scrubbing through perforations
- Centrifugal scrubbing against walls
- Impinging on walls
- Quieting chamber

**NATIONAL LOW PRESSURE SEPARATORS**

Working pressures from 0 to 150 psi
Standard or ASME construction

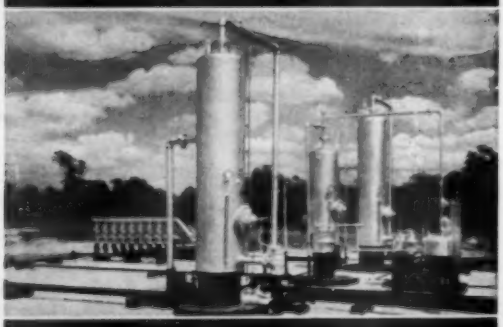
**NATIONAL HIGH PRESSURE SEPARATORS**

Working pressures to 4000 psi
ASME construction

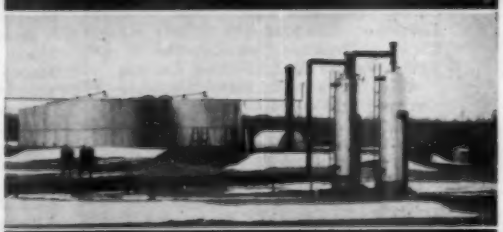
**THERE IS NO POINT WITHIN THE RATED CAPACITY AT WHICH NATIONAL UNITS DO NOT SEPARATE EFFICIENTLY**

**"It's what's in a Separator that Counts!**
**It's what controls a Separator that Satisfies"**

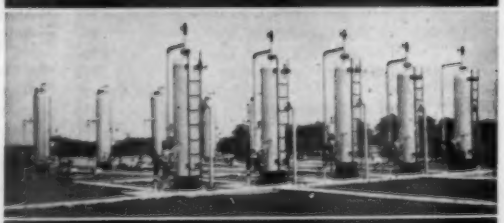
Use National Separators and get top Performance



Low Pressure Separators serve 18 wells in unitized pressure maintenance system. Oklahoma.



Low Pressure Separators, Indirect Heater and Bolted Tanks in Canada.



Low and High Pressure Separators in Stage Separation installation. Louisiana.

It's a National®

## NATIONAL TANK COMPANY

TULSA, OKLAHOMA

# What This Dowell Research Group Means To You

This Dowell Research Group includes four PhD's and four chemical engineers. They are huddling on a particularly knotty production problem for one of Dowell's customers.

At Dowell's Tulsa Research Center there are ten such teams. Their job is to pool their skills and knowledge to help you produce oil and gas more efficiently.

This Tulsa research group is only part of the Dowell Research Story, however. Many of your problems are solved in the field by skilled petroleum engineers and field laboratory personnel. Still a third level of basic research is available to the Dowell customer when necessary—the vast laboratory facilities of The Dow Chemical Company.

Think your problem is unique? Or tough?

Call for a huddle with a Dowell research group. Because their work covers such a wide area, chances are they already have some data that will prove helpful in solving your problem. If they don't, you can be sure you'll get their undivided attention and a wealth of experience.

Dowell, Tulsa, Oklahoma.

*Services for the oil industry* DOWELL

A SERVICE DIVISION OF THE DOW CHEMICAL COMPANY

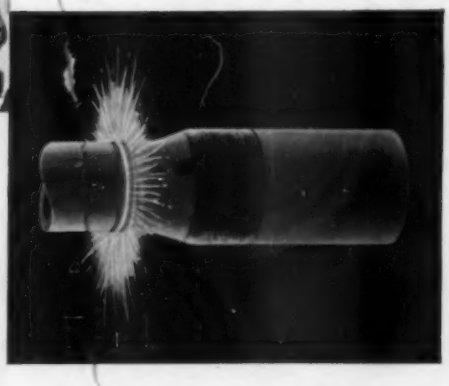
# FLASH-WELD...

## the most dependable and most economical drillstem you can run ...anywhere!

A new heat treating process, *developed by Hughes,* has more than doubled the tension-impact strength of "Flash-Weld" tool joint-to-pipe connections... now makes this *always superior drillstem* better than ever.

Ask the Hughes man about this new, improved Hughes "Flash-Weld" construction. He can also help you to select the type of drillstem best suited to your drilling program. And he will be glad to advise you regarding field hardfacing . . . where and when needed ... and how to get the maximum service out of your drill string.

Be sure your next drill string is unitized with Hughes hardfaced "Flash-Weld" tool joints for *safer, more dependable,* and *more economical* operation.



*Developers of "Flash-Weld", "Seal-Grip" and Counterbore Weld Tool Joints*

FLASH-WELD
A DEVELOPMENT
OF
HUGHES
TOOL COMPANY
HOUSTON, TEXAS